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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

JANUARY 19.

Birmingham Metallurgical Society:—Ordinary meeting. "The Foundry Sands of the Midlands," Paper by J. G. A. Skerl.

JANUARY 20.

Institution of Welding Engineers (Birmingham Section):—"Welding Cast Iron and Ferrous Alloys: "Some Metallurgical Considerations," Paper by J. G. Pearce.

Midland Institute of Mining Engineers:—Ordinary meeting at Leeds. "Further Experiments with Stemming Materials," Paper by J. S. Ritson and H. Stafford.

JANUARY 25.

North-East Coast Institution of Engineers and Shipbuilders:—Ordinary meeting. "Foundry Practice," Paper by L. H. W. Wright.

JANUARY 27.

West of Scotland Iron and Steel Institute:—Ordinary meeting. "Machinability of Steel, as indicated by its Macrostructure," Paper by F. E. Robinson and C. T. Nesbitt.

Institute of British Foundrymen.

JANUARY 20.

Sheffield and District Branch:—Ordinary meeting at Sheffield. "Cupola Control: Its Progress and Value in the Iron Foundry," Paper by E. Wharton.

JANUARY 28.

Scottish Branch:—Ordinary meeting at Edinburgh. "Sand-Testing in the Foundry," Paper by W. G. Buchanan.

A Review of the Foundry Industry.

It is only too well known that industry has been conducted at considerably reduced dimensions during last year, and as it is equally established that other countries have also experienced similar conditions, business men must assure themselves as to whether their section of the industry has had its adequate share of what has transpired. Regarded from a national point of view, the British have just cause to be proud of their achievements. The tables prepared by Mr. MacDiarmid are most informative. It is obvious from them that our position as compared with other countries has materially improved, at least so far as one basic industry is concerned. Moreover, statistics show that Great Britain, when calculated on a sterling basis, is once more the leading exporting country of the world, or, according to another set of figures, the second. Reverting to Mr. MacDiarmid's tables, there is but little to substantiate the statement that weldings are making very serious inroads into the foundry industry, as there has been, in recent years, a distinctly heavier consumption of scrap, both steel and iron and hematite.

Steel Founding.

It is interesting to compare the reviews written by Mr. Lake and Mr. Fosseprez on the steel-foundry industries of Britain and Belgium. Virtually they both tell the same story of price-cutting and its evil effects. During last year a really serious effort was made to reduce the surplus capacity of the industry by purchase of obsolete and redundant plants in much the same way as has been done in the shipbuilding yards. We have not heard that much success has attended their efforts, but it has had the effect of making each individual founder look a little more closely into his relationship with his competitors. A new factor has crept in by the fact that certain ironfounders having pulverised-fuel-fired rotary furnaces are entering the market as occasional steel manufacturers. A serious attempt is being made by some of the steel-founders to meet foreign competition in the supply of castings for the tinplate industry. We have never been able to understand how the foreign suppliers could ever sell at the prices ruling in 1931, but there was obviously as much domestic competition in the supplying countries as there exists here. This is amply borne out by Mr. Fosseprez's remarks. The incidence of tariffs has only recently been felt, as stocks are scarcely yet worked out. It is interesting to note that the average price for imported steel castings has fallen by 8s. a ton whilst our exports have commanded more than £6 a ton more. Naturally, these figures require closer examination than their mere acceptance, as the character of the business varies from time to time. Any detailed examination of this section of the foundry industry would reveal that it is the heavier side that has suffered the more. It is catastrophic that a foundry of the standing of Darlington Forge should have its doors closed. On the other hand, some of the foundries casting loud-speaker magnets for the wireless industry have been kept reasonably busy in their alloyed-steel department.

The French development which we recorded in the summer relating to the replacement of sand by a form of cement as a mould material, has been tried out in this country without achieving any real success. Even if it succeeded technically, time and floor-room occupied would damn it commercially for the large industrial centres.

Non-Ferrous Activities.

The low price of virgin metals has not been of the slightest assistance to the non-ferrous industry except that now melting costs assume a relatively much greater importance in the production costs than when normal prices are ruling. The tariffs have helped one prominent London foundry, as it is now quite busy on making instruments previously imported from Germany. Technically, nickel seems to be making considerable headway as a non-ferrous alloy addition. The light-alloy section has probably suffered less than any other section of the foundry industry. It is constantly finding new outlets for aluminium alloys, and a new field is the provision of dyed castings after an anodic treatment for architectural use and domestic fittings. The light-alloy trade has received much useful help from the publications of the British Aluminium Company, both of a suggestive and technical character. The study of this firm's publicity matter has helped in no small measure to counteract the competition from gum, resin and milk products. In general, articles coming under the classification of plastics are not maintaining their early success. Fading, crazing and brittleness are gradually being appreciated by the discriminating buyer.

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Malleable Foundries.

We want to congratulate this important section of the foundry industry on the enterprise it has shown in recent years. A number have had the courage to instal pulverised-fuel-fired furnaces. They have kept their shops reasonably well occupied and they have made considerable technical progress. One thing they have done—quite unnecessarily—is to cut prices. If only they, in common with every other section of the industry, would realise that they are neither up against any real foreign competition nor the existence of huge stocks, they could do really remunerative business. Whilst the second is obvious, the first factor—the result of tariffs—is made evident by the fact that the manufacturers of the well-known G. F. malleable fittings have made arrangements to open a new foundry at Bedford in the premises lately the works of J. & F. Howard. The honour of presenting the first technical report from any section of the industry fell to the malleable-iron sub-committee. Whilst controversial in some aspects, it was particularly praiseworthy, as it places on record the existing state of the science and so forms an excellent "jumping-off ground."

Ironfounding in General.

Last year saw an acceleration of quantity production, despite trade conditions. The Eastleigh foundry of the Southern Railway has been mechanised, whilst the National Radiator Company installed a new continuous casting plant of very important dimensions. The list of such plants now grows apace, and we are satisfied that, whilst British developments for a long time lagged behind their foreign competitors, the results now achieved prove that the plants now in operation have been very intelligently designed and are particularly well managed. When a party of Americans visited this country in 1923, one could have counted the mechanised foundries on one hand. To-day there must be at least 30 such plants either installed or in course of construction. A vertical core stove of British design has leapt into popularity for this type of foundry.

For the ordinary jobbing foundry matters have become more difficult, because there has been a general tendency for competition to be of a national rather than local character. This has probably intensified price-cutting, but has resulted in trade gravitating to the shops concentrating in one type of casting, and has increased specialisation. Price-cutting has resulted in the increased use of scrap, and this has caused more attention to be paid to cupola practice and increased the use of soda ash. The publicity given to this process has indirectly called attention to the sulphur content of the coke used for melting, and attention is now being focussed upon the form in which the sulphur exists in the coke, because quantity as expressed in percentage is not the whole story. The use of refined irons and the like is growing in popularity as the knowledge of a definite composition of an important raw material eliminates a few variables in an industry cursed with too many. Alloy cast irons of the nickel-chrome variety have continued to make progress, and their properties have materially widened the field of the ironfounder. The research and development departments of the nickel manufacturers have done excellent work in enlightening both manufacturer and user as to the potentialities of well-made alloyed iron castings.

Light Castings.

Last year at this time we echoed Sir Gervais Rintoul's call for co-operation within the industry. Yet we had serious doubts that there would be a hundred per cent. response and we knew that nothing other than that would be of real use. The harm done to the industry is set out by Mr. Blair authoritatively elsewhere in his review. We say quite openly to the foundries which remained unaffiliated that they have done a great disservice to this once prosperous and important industry. Negotiations are still continuing and we can only hope that they will result in a cessation of this war of attrition, which, like the great war, may leave the victor no better placed than the vanquished.

The stove-grate, baths and kindred industries has lost about a third of its export trade, all countries having reduced their orders. Last year only 10,536 tons, valued at £442,894, were exported, which compares very unfavourably with 13,962 and 17,852 in the two previous years. A further adverse factor is the fall in the average price of exports from £44 to £42 per ton. A surprising factor on the import side is the great increase in arrival of cast enamelled hollow-ware, which has risen from 50 tons in 1931 to 249 tons in 1932.

Automobile Foundries.

Whilst the most optimistic could not say that the automobile industry had been busy, there certainly have been good grounds for a certain amount of congratulations. The way in which the British motor-car is gaining in popularity in overseas markets is very pleasing. Conditions have now reached such a point that about 14 per cent. of the production is being exported. The outstanding event of the year has been the putting into production of the Ford Works at Dagenham. The most striking feature of the new foundry to our mind is the very extensive use made of Bentonite and clay-free sands, though the installation of two large electric furnaces for superheating and adjusting mixer metal is very impressive.

The Morris foundry has changed some of its equipment in order to ensure still more economical production. The unattached foundries have done reasonably well and can be characterised as being "always on their toes" to keep abreast of modern developments. Here, too, price-cutting has been creeping in and an effort has been made to arrest it by the formation of an employers' federation, but difficulties really do exist in this connection.

Pipe Founding.

The imports of cast-iron pipes last year fell to 2,773 tons, whereas in 1931, 13,744 tons were received from abroad, and 21,038 in 1930. Whilst the value in 1930 and 1931 averaged about £11 a ton, the lesser quantity of 1932 averaged over £17. On the export side, Britain has sent abroad 65,635 tons, as against 72,776 in 1931 and 116,279 in 1930. The declared average value per ton was at £12, about £1 higher than in 1931. We have great faith in the future of this section of the trade, as the management of the large-pipe foundries is amongst the most intelligent and enterprising to be found in the whole of British industry.

Other Foundries.

Last year saw the break-up of the large combine in the agricultural-implement trade. This section, with the exception of dairy-machine side and small engines, has been badly hit. The electrical foundries have been reasonably well employed on the light side, but slack on the heavy. Even the railway foundries have been running at reduced outputs. On the technical side they have, according to Mr. Millington, been seriously concentrating on the elimination of waste and the standardisation of methods of production. The shipbuilders' foundries have been hit more severely than any other section of the industry. The jobbing foundries, even if they have not been overburdened with orders, have certainly had an interesting time in quoting for jobs of types unfamiliar to them. The large group of textile foundries have experienced a slight improvement as the year went on, a movement which is expected to accelerate this year.

Technical Developments.

Reviewing the technical developments for the year, it cannot be said that there has been any outstanding or startling novelty from the purely metallurgical side. This applies equally to the research from the United States of America, from Germany, and from France, as well as from this country. We do not, of course, say this critically, because really striking research development is a matter of once in a generation rather than an annual event, and considerable periods of consolidation and verification follow on a really striking discovery. Various developments are in course of commercial development, details of which have not yet found their way into print, but perhaps the most striking feature of the year has been the activity in connection with furnace development. Not only has the progress of the pulverised-fuel rotary furnace been continued, but oil-fired varieties for small outputs have made their appearance. The new balanced-blast design appears to have given a fresh lease of life to the cupola.

The Paris Foundry Congress was notable for a large crop of Papers, and a number of these were of very great interest, although in others French work and experience substantially confirmed results previously obtained elsewhere. Thus, the Papers on special additions to cast iron and alloy cast irons did not substantially add to our existing knowledge, but some of the Papers on moulds and cores were novel and of extreme interest, particularly the Paper dealing with the use of hydraulic cement. An attempt was made to consider a systematic policy for the industry in meeting the competition of wrought, forged, and welded materials, and plastic materials, which have come to the forefront so much in the past few years. The French have also devoted much attention to the consideration of the factors which affect the capacity of a metal to fill a mould, as measured by a spiral test-piece. Some of these are now being used in this country. The production of low-carbon irons in the cupola attracted a good deal of attention, and there was another interesting Paper on factors which affect the stability of foundries which concentrate on production of one line. Whatever the effect of the current trade condition on the attendance and exhibitors at Paris, it certainly did not diminish the quantity of technical and scientific material made available for discussion.

Conclusion.

We value very highly the confidence accorded to us by the various employees' federations existing within the industry. We sympathise with the difficulties they have experienced, and we offer, as a solution, a new organisation by the fusion of all existing ones into one great federation, on the lines of either the Verein Deutscher Eisengiessereien or the Syndicat des Fondeurs. These are subdivided into regional associations and sections covering each branch of the industry. The great advantage of such a scheme is that there is always a ready-made organisation, with a wealth of experience behind it, ready to bring any group of manufacturers together immediately they feel they can compose their differences, whilst, additionally, the one big union would constitute a political force of no mean order. We are well aware that the National Ironfounding Employers' Federation does act as a clearing house for the local associations and is doing excellent work. It is a rapid acceleration of this activity that we so strongly advocate.

MESSRS. HEPWORTH & GRANDAGE, LTD., engineers and ironfounders, of Bradford, and specialists in the making of automobile piston rings, pistons and other motor parts, have lately made considerable enlargements at their St. John's Works and have introduced the single-cast system of making piston rings. Hepworth & Grandage, who believe they are the only firm in England producing rings on the single-cast system, claim that the method ensures greater equality of hardness, strength and structure on all four surfaces of the ring. The firm have recently appointed Mr. Horace J. Young, metallurgist, to take charge of the scientific and research side of their undertaking.

Light-Alloy Foundry Trade—Review of 1932.

By E. PLAYER (Director, Sterling Metals, Limited, Coventry).

Economic.

IT is to be supposed that the light-alloy foundry trade cannot look back on the year 1932 with much more satisfaction, from a financial aspect, than most other British industries. The great excess of supply over demand, which still continues, maintains a buyer's market, under which the conditions aluminium castings are bought and sold at prices which, in many cases, are undoubtedly financially unsound. It would seem that two factors only are likely to remedy this state of affairs; first, the operation of that rigid law "survival of the fittest," and secondly, a general all-round improvement in trade conditions. The operation of the first-mentioned factor can confidently be relied upon, and it would be well for all light-alloy foundries to bear this well in mind, and to strive to act in accordance therewith by bringing production costs and selling prices into a known and healthy relationship. As to the second factor, the wise man will probably hope for the best and prepare for the worst, by mortgaging nothing to a future built on a too optimistic presumption.

It is, perhaps, too early to assess what effect, if any, the incidence of tariffs has had, or is likely to have on the light-alloys foundry trade. Directly there can be little influence, as there must be little importation of raw light-alloy castings at any time. In certain directions the foundries may benefit, due to machines using light-alloy castings being made in England instead of abroad as in pre-tariff days. This is all to the good, but it is hardly flattering to our natural vanity if the stimulus of a protective tariff is to take the place of our engineer's inventiveness.

The increased cost of aluminium ingot, presumably consequent upon currency depreciation and the tariff, is not likely to help the foundries, as such serious competitors as cast iron and steel are little, if at all, affected. The development of light alloys possessing new and valuable characteristics is likely to be more helpful to the foundry than any fiscal policy, and here, at least, there are signs of enterprise, courage and inventiveness.

Alloys.

During the past year a number of the newer light alloys have definitely established themselves as valuable contributions to our range of engineering materials, and from the results obtained it would seem that we are in a *renaissance* period of light-alloy development compared with the previous twenty years or so of light-metal history. It will suffice to mention, as encouraging examples, the steady development of the RR. series, possessing excellent foundry and physical properties; the newer MG7 and Birmabright alloys, both having unusual corrosion-resisting properties with good physical strength; the magnesium-base alloys, chiefly valuable on account of their very high strength-weight ratio, and the high-silicon alloys possessing low-expansion coefficients with a considerable degree of strength and hardness, fitting them admirably for such purposes as internal-combustion-engine pistons.

A review of the progress made in these directions should be of the utmost encouragement to research workers and foundrymen, as indicating a steadily-extending outlet for the results of their work. As an instance of this, the corrosion-resisting alloys are already entering considerably into architectural and marine constructions, purposes for which a few years ago light alloys were considered quite unsuitable.

Technique.

The study of the effects of heat-treatment on light alloys has undoubtedly made considerable progress during the past year, and the sphere of application of such alloys has been greatly widened by the valuable characteristics obtainable in various alloys after suitable heat-treatment. The actual nature of the physical changes effected by such processes is not yet, in all cases, clearly understood, but sufficient data have been accumulated to give good hopes that eventually the heat-treatment of light alloys may become a more or less exact science. The protection of light alloys against surface attack of corrosive reagents has also made considerable advances both with aluminium-base and magnesium-base alloys. The anodic treatment for certain aluminium alloys and various chromate

MR. E. PLAYER
(*Director, Sterling Metals, Limited*).

treatments for magnesium alloys are cases in point.

Whilst the founder is seldom called upon to supply castings already treated by such processes, it is well he should keep himself informed of the progress made in this direction, which can readily be accomplished via the various technical societies and literature. The causes and effects of gas absorption and re-precipitation on aluminium alloys have received a great deal of attention of recent years, and there is no doubt that the foundries owe a considerable debt to the various workers who have so patiently investigated this problem. From the work already done, we now have considerable information as to the causes and effects of this unpleasant characteristic of the aluminium alloys, but much remains to be done before a simple and effective workshop cure is available.

In the production of high-grade castings there seems little doubt that gas-free metal will give better results than gas-impregnated metal. With this conceded, the desirability of continued investigation is apparent. If the ingot producers are in a position to furnish the foundries with metal reasonably low in gas content, it would appear that, in the foundry, efficient means of preventing further gas absorption may well be better than subsequent gas elimination.

The steady advance made in the production of gravity and pressure die castings calls for some comment, as in this country, the design and manipulation of dies has reached a pitch of excellence, which, in the field of gravity castings, is probably excelled nowhere, and equalled in few other countries. The production of aluminium alloy die castings is now probably in the region of 3,000 tons per annum, ranging from pressure castings at fractions of an ounce to gravity castings up to 38 lbs. within the writer's knowledge.

Magnesium-base gravity die castings have also been developed commercially during the past year, pieces weighing up to 10 lbs. each being produced of excellent quality and at commercial prices. This progress has been going on for some years without noise or advertisement, and one is entitled to assume that an industry capable of such patient and effective work has within itself a vitality and initiative that augurs well for future healthy growth.

Equipment.

Following the foregoing line of thought, if relatively gas-free castings are to be produced, there seems little doubt that prevention is better than cure, which creates an incentive for improved furnace design. The electric-resistance furnace is probably the ideal melting unit for light alloys generally, if it were possible to ignore costs. Technically it should be possible to melt aluminium and other alloys in such a furnace with so low a gas absorption as not to be perceptible in the resultant castings. Unfortunately, the cost of current in most parts of the country prohibits the use of such furnaces except for very special work.

Is it too much to hope that the various power stations may yet give very preferential rates for current used for metallurgical processes of this type, and so bring the electric furnace into wider use? The combustion type of furnace, whether the fuel be coke, coal, gas or oil, is definitely more liable to infect the metal charge with gases, than is the electric furnace. The fuel costs are, however, so much less than that of the electric furnace, that the great proportion of foundry production derives from combustion furnaces. Probably the best compromise between the technical ideal and the commercially practicable will be found in the use of a well-designed crucible furnace using an impervious cast-iron pot with the charge virtually isolated from the products of combustion and from the atmosphere.

The development of plant for the heat-treatment of light alloys has kept pace with the advance in such alloys, and the range available is such that there is no difficulty in obtaining units to suit any particular process, with the assurance that the operations will be carried out accurately and economically. Moulding and core-making appliances need little comment, as, except in detail, there appears to have been little advance of outstanding interest during the past year.

These somewhat rambling and discursive musings will, it is to be feared, contribute exactly nothing to the sum of human happiness or to the prosperity and success of the light-alloy foundries. But it is hoped that the various advances to which attention has been drawn will help to instil into those engaged in the light-alloy foundry trades that confidence without which success is impossible.

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Apart from this work of a national and international character, the ordinary work in the Branches has not been neglected. Meetings are held periodically in over twenty cities and towns throughout the country by various Branches and Sections of Branches, so that the Institute provides more opportunities than probably most technical societies for its members to attend meetings: to hear Papers at first hand; and to take part in discussions. That this policy is appreciated is shown by the fact that many members travel considerable distances to attend the meetings of their Branch, sometimes even on Saturday afternoons or evenings. The works visits, which are arranged by the Branches at the invitation of many firms, are very largely attended. The policy of the Institute is thus very democratic. It insists on meeting the requirements of all and in keeping in close contact with the individual member. The individual member, in turn, responds by his constant attendance, in spite of considerable personal inconvenience in many cases.

The Section of the Lancashire Branch formed at Preston at the end of 1931 has maintained the enthusiasm with which it was launched; and the meetings promoted by the Scottish Branch in Edinburgh have, this year, been increased in number.

The work and management of the Branches and Sections entails a considerable amount of work by the local Branch Councils, and particularly on the part of the Honorary Branch Secretaries. No review of the year's work would be complete without paying a tribute to the most excellent and devoted work which is carried out by these officials.

Many matters of an administrative character have received lately the attention of the general council and of the branch councils. A Sub-Committee has been engaged on a revision of the Bye-Laws and Rules, and will shortly submit a draft of its work for consideration. Economy in administrations has received close attention, and it is satisfactory to be able to record that under the wise guidance of Mr. W. B. Lake, Honorary Treasurer, the considerably increased amount of work has been carried out without materially increasing the expenditure.

A tribute is due to the work of Mr. W. Jolley, who was Convener of the Technical Committee from its inception in 1930 until June of last year. Mr. Jolley's personality, his organising ability and his enthusiasm, were largely responsible for the initial success of the Committee. It was with considerable regret that his colleagues on the Committee and the General Council learned that, on medical advice, he found it necessary to reduce the number of his active interests and to resign his Convenership. Mr. J. W. Gardom, who was extremely successful as Convener of the Sub-Committee on Malleable Cast Iron, was appointed Mr. Jolley's successor. Mr. Gardom's energetic leadership has already shown itself to be of the utmost value.

The Institute is still open to receive new members, and appeals particularly to firms in the industry to join as subscribing firm members, and thus support work from which they will derive considerable ultimate benefit. The Information Bureau, alone, can be worth very many times the subscription.

During the twenty-nine years which have elapsed since the Institute was founded the technique of the foundry trade has been revolutionised. The foundries of to-day can give castings of a tensile strength undreamed of a few years ago; castings in corrosion-resisting and heat-resisting metals; castings of extremely complicated designs; light-weight castings of remarkable strength; and art castings which enrapture. The internal practice of foundries has also altered considerably. Cupola practice is now, of course, a scientifically-controlled operation. Production costs have been lowered and output increased by the greater adoption of moulding machinery; automatic conveying systems; improved coremaking methods; and a host of other mechanical aids. The scientific study of moulding sands, bonds and facings has resulted in improved appearance and finish of the castings, and in further reduction in costs.

Much of this progress is due to the interchange of opinion which has been made possible through the medium of the Institute of British Foundrymen, and the Institute itself has adapted its aims, its outlook and its organisation to meet the changing conditions of the industry which it serves. It is a live and virile organisation, and one looks forward to its future with optimism.

The Foundry Industry Month by Month.

January.

BRITISH CAST IRON RESEARCH LABORATORIES damaged by fire.

INSTITUTE OF BRITISH FOUNDRYMEN elects over 100 new members.

MR. F. J. COOK and MR. JOHN SHAW elected honorary members of the Institute of British Foundrymen.

BOARD OF TRADE census of production publishes statistical report of foundry industry in 1930.

PRINCE GEORGE visits Carron Ironworks.

February.

WEST RIDING OF YORKSHIRE BRANCH organise their first annual dinner.

DR. HORACE W. GILLETT is awarded the Macfadden Medal by the American Foundrymen's Association.

MR. HARRY BREARLEY deposits sealed envelope with the Cutlers' Company, containing the history of the discovery of stainless steel to be opened in 1960.

SIR OLIVER LODGE, F.R.S., is awarded Faraday Medal.

PROF. W. A. BONE is awarded the Melchett Medal.

PROF. HENRY LOUIS is awarded the Bessemer Gold Medal.

March.

SOUTH-EAST LONDON TECHNICAL INSTITUTE is opened by Sir John Gilbert.

INSTITUTE OF METALS organise a symposium on testing of castings.

INSTITUTE OF BRITISH FOUNDRYMEN AND CAST IRON RESEARCH ASSOCIATION visit British Industries Fair.

SIR HENRY FOWLER is elected President of the Institute of Metals.

PROF. PORTEVIN and MR. CHARLES DUFOUR elected honorary members of the Association Technique de Fondèrie.

DR. R. S. HUTTON, Director of the B.N.F.R.A., is elected Goldsmiths' Professor of Metallurgy at Cambridge.

DR. GUIDO VANZETTI lectures before London and Lancashire Branches of the Institute of British Foundrymen.

MR. H. F. COGGON is elected first President of the Yorkshire Branch, Works Managers' Association.

MR. SUMMERS HUNTER is elected Honorary Fellow of the North-East Coast Institution of Engineers and Shipbuilders.

MR. D. R. WILSON succeeds Sir Gerald Bellhouse as H.M. Chief Inspector for Factories.

MR. J. RAILING is elected chairman of the B.E.A.M.A.

April.

INSTITUTE OF BRITISH FOUNDRYMEN elects 33 members.

SIR GEORGE BEHARRELL is elected President of the Federation of British Industries in succession to Sir James Lithgow.

NEW IMPORT DUTIES imposed.

MR. A. E. OSBORN is elected President of the Staffordshire Iron and Steel Institute.

May.

AT MAY MEETING of Iron and Steel Institute, under the chairman, Sir Charles Wright, includes Papers by J. E. Hurst, J. G. Pearce, E. Morgan, Dr. J. W. Donaldson and Mr. Kriz, covering foundry subjects.

DR. R. KÖRBER delivers May lecture to Institute of Metals.

MR. D. HOWARD WOOD is re-elected President of the Foundry Trade's Equipment and Supplies Association.

SIR HAROLD CARPENTER is awarded Gold Medal of the Institute of Mining Metallurgy.

June.

ANNUAL MEETING OF Institute of British Foundrymen in Newcastle. Mr. Victor Stobie is elected President. Lord Mayor accords civic reception. Mr. J. E. Hurst is awarded the Oliver Stubbs Medal. Eight Papers are presented for discussion, Mr. MacPherran being responsible for the American, Mr. Pillon for the French. Exchange Papers. First Technical Sub-Committee Report presented.

GENERAL T. S. HAMMOND is elected President of the American Foundrymen's Association.

MR. E. J. FOX is elected chairman of the Society of British Gas Industries.

MR. CHARLES MITCHELL is elected chairman of the National Committee for the Reorganisation of the Iron and Steel Industry.

MR. ROBERT L. MOND, President of the Faraday Society, receives a Knighthood.

July.

MR. C. J. DADSWELL, assistant foundry manager, is awarded Robert Blair Travelling Fellowship.

BRITISH CAST IRON RESEARCH ASSOCIATION new laboratories opened by Lord Rutherford of Nelson.

MR. W. J. REES is awarded 100 guineas from the Sir George Beilby Memorial Fund.

August.

THIS MONTH sees the following elected as Presidents of the Sections of the Institute of British Foundrymen :—Mr. J. G. Pearce (Birmingham), Mr. C. W. Bigg (East Midlands), Mr. J. Feasey (Lincoln), Mr. E. Flower (Lancashire), Mr. James Taylor (Burnley), Mr. W. Dryden, jun. (Preston), Mr. H. G. Sommerfield (London), Mr. S. P. Thorpe (Middlesbrough), Mr. W. Scott (Newcastle), Mr. H. D. Campbell (Scottish), Mr. T. Shanks (Falkirk), Mr. C. D. Pollard (Sheffield), Mr. W. Williams (Wales), Mr. A. S. Worcester (West Riding).

DR. W. ROSENHAIN is elected honorary member of the Deutsche Gesellschaft fur Metalkunde.

INSTITUTE OF MECHANICAL ENGINEERS visits Canada and the United States.

MR. JOSEPH HEPWORTH, M.P., is added to the list of new magistrates of Bradford.

September.

FOURTH INTERNATIONAL FOUNDRY CONGRESS is held in Paris under the presidency of Mr. E. V. Ronceray. Mr. Andrew Harley, President of the Foundrymen's International Committee, is principal guest. Visitors received by President of Republic. No less than 39 Papers were presented and discussed. British delegation numbers 32.

MR. MAAS GEESTERANUS is elected President of the Foundrymen's International Committee.

IRON AND STEEL INSTITUTE and Institute of Metals organise Joint Conference in London.

NEW TECHNICAL SCHOOL is opened in Falkirk by Mr. W. W. M'Kecknie.

ANNUAL MEETING of the German Foundry Employers' Federation is held in Berlin. A number of technical Papers are presented.

DR. HAROLD MOORE is appointed Director of the British Non-Ferrous Metals Research Association.

October.

SIR DUGALD CLARK is re-elected President of the Institute of Civil Engineers.

MR. J. B. HUTCHINSON is elected President of the Shipbuilders' Employers' Federation.

INSTITUTE OF BRITISH FOUNDRYMEN elects 40 members.

MR. CHARLES SCHWAB is awarded the Melchett Medal.

MR. ARTHUR S. YOUNG is elected Master of the Founders' Company.

LT.-COL. A. N. LEE is installed Master Cutler.

(*Concluded on page* 41.)

The Foundry Industry of Czecho-Slovakia.

By PROF. DR. MONT. FR. PISEK.

THE industrial and economical crisis was fully felt last year in the Czecho-Slovakian foundry industry, which is absolutely dependent on the export trade of either castings or of finished machines. The import prohibition on the part of various States which were the principal buyers from Czecho-Slovakia reduced employment in the different foundries from 20 to 40 per cent. of normal production capacity. Thus, the production from Czecho-Slovakian foundries last year reached the lowest level within living memory. Associated with this is a corresponding decrease in the production of such foundry raw materials as pig-iron and coke. The output of foundry coke decreased to one quarter the normal production; whilst in pig-iron the situation was virtually the same. Similarly, the refractory-materials industry is badly hit.

The importance of the foundry industry in relation to the commercial life in Czecho-Slovakia is evident from these statements. In the peak year, 1929, there were in Czecho-Slovakia approximately 550 foundries (grey-iron, malleable-iron, steel and non-ferrous) producing about 360,000 tons of castings of a total value of about 1½ milliard czeck crowns and paying more than a quarter of milliard czeck crowns in wages.

Forthcoming Congress.

This year, 1933, the International Foundry Congress will take place in Czecho-Slovakia and the foreign foundrymen will have the opportunity of convincing themselves through their personal experience of the worth of not only the Czecho-Slovak foundry industry but also the Czecho-Slovakian raw materials required by the industry. The Congress will take place from September 9 to 17 in Praha (Prague), Moravská-Ostrava-Vitkovice (Mährisch Ostrau-Witkowitz), Brno (Brünn) and Plzen (Pilsen). These places are shown in Fig. 1. These are the main centres of the Czecho-Slovakian foundry industry or those from where its raw materials are obtained.

PROF. DR. MONT. FRANT. PISEK.

Prague.

Prague, the capital of the Czecho-Slovak Republic, inhabited to-day by more than 800,000 people, is the seat of some important engineering works equipped with large modern foundries. The largest of these establishments is Ceskomoravská-Kolben-Danek, Limited (Czecho-Moravian, Kolben, Danek Company), which has three works in Prague, one branch establishment in Slany and one in Blansko. These works are the results of the fusion of three large companies, namely, Czecho-Moravian Engineering Works, including the "Praga" Automobile Manufacturing Company with the Electrical Engineering Company, Limited, formerly Kolben & Company, and the Engineering Works, formerly Breitfeld Danek & Company. The manufacturing programme of C.K.D. works is very extensive, covering nearly all the specialities of the mechanical and electrical-engineering industry, such as locomotives, all kinds of machines, equipment of sugar factories and the like. The automobile works "Praga" is one of the largest factories for automobiles in Czecho-Slovakia. In normal times the C.K.D. Works employ approximately 18,000 operatives.

The foundries of these works are concentrated at Vysocany works (a suburb of Prague), and consist of foundries for grey iron, cast steel, malleable cast iron and non-ferrous metals, and normally employ 1,500 workmen and 80 specialists and clerks. The most modern of these

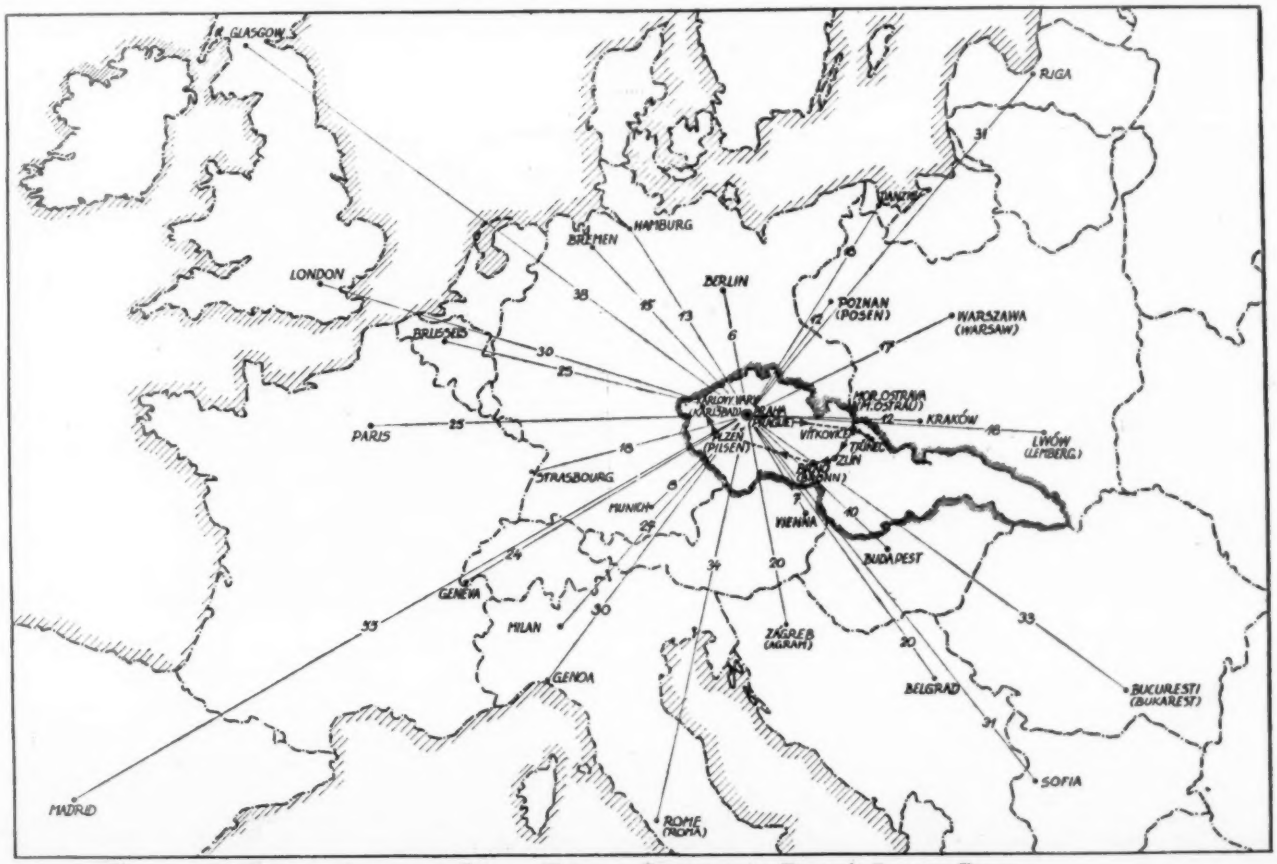


FIG. 1.—TRAVELLING TIME IN HOURS TO PRAGUE FROM EUROPE'S LARGEST TOWNS.

G 2

foundries are those for grey iron and for non-ferrous metals.

The grey-iron foundry is one of the most modern and largest in the country, having been created in 1929 by the merging of the old, and now abandoned, foundries of the three constituent companies. This foundry is designed for an annual output of 10,000 tons castings and produces all types of castings, including heavy castings up to 50 tons, medium and small castings, especially automobile cylinders, which are produced on quantity-production lines.

Fig. 2 shows the general lay-out of this foundry, which is 133 metres long by 70 metres wide, and is divided into series of bays for heavy, medium and light moulding, all the bays being served by overhead travelling cranes and by lattice-masted jib cranes. The melting equipment consists of four cupola furnaces, two of 900 mm. and two of 700 mm. dia. and one of 5-ton electric-arc furnace. The core ovens, the transporting machinery, the sand-preparing plants and other auxiliary machines are of the most modern construction, as is shown by Fig 3, which illustrates the small-castings bay.

The non-ferrous metal foundries are also of recent construction and produce all kinds of bronze and brass alloys, aluminium and electron castings (magnesium), mostly for their own use. Established in the same year as the grey-iron foundry, these foundries are equipped with the best existing furnaces and machines.

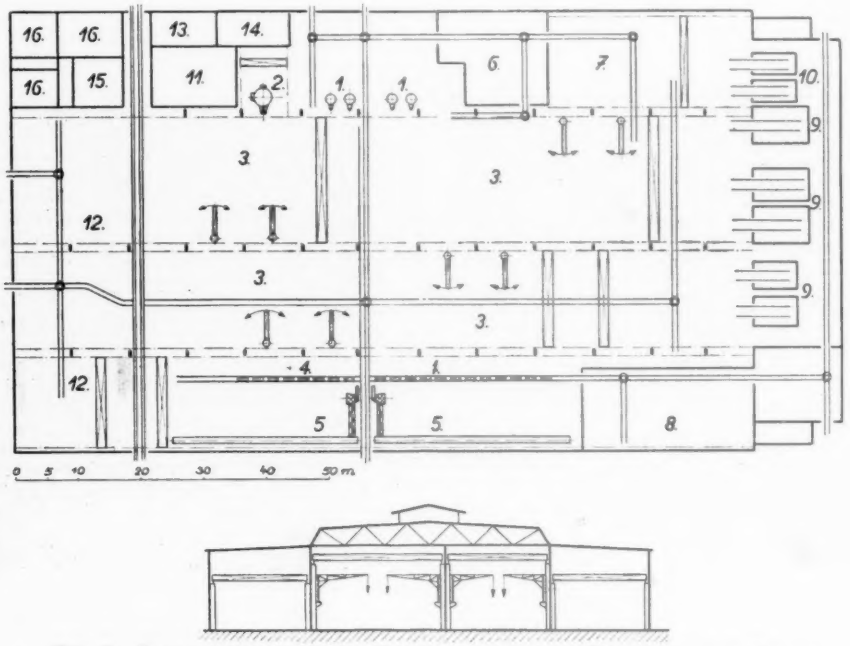


FIG. 2.—PLAN OF THE GREY-IRON FOUNDRY OF THE C.K.D. COMPANY AT PRAGUE.

1—Cupolas. 2—Electric furnace. 3—Moulding floor for small castings. 4—Mass production section. 5—Sand preparation plant. 6—Sand preparation plant. 7—Large core-making shop. 8—Small core-making shop. 9—Mould drying ovens. 10—Core-drying ovens. 11—Transformer room. 12—Fettling shop. 13—Mechanical testing laboratory. 14—Electric furnace control panels. 15—Stores for patterns in use. 16—Offices.

ing and large engines. This steel foundry has three acid open-hearth furnaces of capacities from 15 to 20 tons, fired by producer gas, and one 5-ton furnace fired with waste tar-oil fuel and a 5-ton Heroult electric arc furnace. The annual output of the steel foundry is about 4,000 tons of castings.

To the steel foundry is attached the malleable cast-iron foundry; the malleable cast iron is melted in the same furnaces used for producing the steel; the steel charge being followed by the malleable cast-iron charge. The annual output of this foundry is about 1,200 tons of malleable cast iron, including both black- and white-heart. It may be mentioned that in this foundry no Swedish charcoal iron is used, recourse being had to domestic coke blast-furnace pig-iron.

The region between Prague and Pilsen territory with its extensive forests, is dotted over with foundries, successors to small blast furnaces. The basis of the iron industry in this country, existing since times immemorial, are the iron ores; these are embedded in the silurian formation in veins of 15 to 30 metres thickness and have an oolitic structure. The ores consist principally of chamoisitic oolites bonded with sideritic material, which after sintering contain 38 to 44 per cent. Fe and 1.0 to 1.5 per cent. P.

At the present time mining in this region is concentrated in the region of Nucice, near Prague, the annual output being approximately 8,000,000 quintals, and forms the chief supply of Czecho-Slovakian ores. These ores are smelted in the blast furnaces of two large ironworks, at Kladno and Kraluv Dvur, owned by the Prague Iron & Steel Company. The old and small blast furnaces of this region, using charcoal as fuel, being unable to compete with the large coke-fired blast furnaces, have been changed to grey-iron foundries.

Kladno Ironworks.

The ironworks at Kladno have four furnaces producing only basic-Bessemer pig-iron, a basic-Bessemer steelworks, with five converters each of 15 tons capacity, basic steelworks with eight basic-open-hearth furnaces each of 30 tons capacity and rolling-mill plant producing bars, rails, wire, and railway material of the lighter kind.

More interesting for the foundrymen are the ironworks in Králuv Dvur, which has four blast furnaces and produces, besides basic-Bessemer pig-iron, foundry irons with 1 to 2 per cent. P. This foundry pig-iron is partly worked up in their own foundries, producing ordinary commercial castings and cast-iron pipes up to 1,200 mm. in

FIG. 3.—THE GREY-IRON FOUNDRY OF THE C.K.D. COMPANY, SHOWING SMALL CASTINGS PLANT EQUIPPED WITH OVERHEAD SAND DISTRIBUTION TO THE MACHINES FROM THE CENTRALLY-SITUATED PREPARING PLANT.

FIG. 4.—THE WOOD AND METAL PATTERN SHOP AT THE C.K.D. FOUNDRY AT PRAGUE.

The new shops for making wooden and metal patterns, shown in Fig. 4, completes the new foundry equipment.

The cast-steel foundry, created in 1898 and inscribed on Lloyd's List, exports, in normal times, large quantities of castings for shipbuild-

diameter. For the smaller pipes up to 450 mm. in diameter the foundry is equipped with four rotary casting machines of the "Ardelt" type. The annual output of castings is approximately 20,000 tons. Besides this large foundry there is at Králuv Dvur a light-sheet rolling mill with a plant for galvanising them. Though Kladno is situated in a coal basin, the blast-furnace coke has to be obtained from the Ostrava coalfield, the Kladno coal being unsuitable for coking.

Very interesting will be the visit to the United Carborundum & Electrite Works Company at Staré Benátky, near Prague. These works, founded in the year 1893, were the first works of this kind in Europe and produced the first carborundum wheels. In 1896 these works manufactured artificial corundum, and they were for this product, for a long time, without competition in Europe, and still are for many things to-day. The works cover the home market with

Fig. 5.—View of the Ardelt Pipe-casting Plant at the Vitkovice Works.

Fig. 7.—The Semi-automatic Plant erected for the Small Castings Section of the Vitkovice Works.

Kladno is also seat of the world-renowned Poldi Steelworks, erected in 1889 and working since 1907 with electric-steel furnaces. The equipment of the Kladno work consists of an electric-steel plant, rolling mills for bar steel, wire and billets, large forge with steam hammers and hydraulic presses, a drop-forging department, a spring factory and a sheet department. Poldi produces only high-grade and special steels for the most varied fields of application. The total number of workmen employed in the Poldi Works at Kladno and in the branch works in Chomutov is, in the normal times, about 4,000.

Fig. 6.—The Heavy Foundry at the Vitkovice Works.

one-quarter of their production, the rest being exported. At normal times they employ 500 workmen and more than 100 clerks.

Carborundum, or carbide of silicon, is produced in electric furnaces through the reduction of silica by means of carbon; the raw materials required are: approximately 60 per cent. of glassmakers' sand, 40 per cent. of crushed anthracite or coke, 6 to 10 per cent. of sawdust and 8 to 12 per cent. of salt. The sand in the charge becomes reduced between electrodes to silicon and combines with carbon to form carborundum. The reduction temperature being approximately 2,000 deg. C., the time of firing lasts from 24 to 36 heurs. The furnaces are built for 500 kw. and use 500 volts at 5,000 amperes.

The carborundum produced, having a beautiful irridescent, crystalline form and being of extreme hardness, is crushed in wheel mills, washed, dried and classified according to size.

Electrite is an artificial corundum, which is obtained by fusing bauxite in an electric furnace. The raw bauxite is first crushed; afterwards it is calcined in a rotating furnace at 1,000 deg. C., and then coke is added to it for the reduction of the iron during melting. The bauxite is melted in an electric-arc furnace with a current of 100 volts at 1,500 amperes, which gives a temperature of about 2,500 deg. C. The major part of impurities is removed with the reduced iron, which contains 13 per cent. Si and is sold to foundries.

The thoroughly cooled block is cleaned, then crushed by means of a rammer, and finally the pure electrolite is crushed in mills. Before placing on the market the electrite is mechanically purified by means of a magnet and chemically by acids, and classified according to grain size.

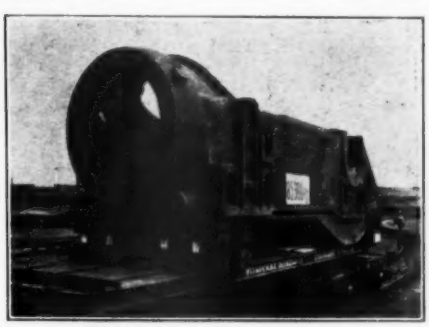


Fig. 8.—Gas Engine Frame made at the Vitkovice Works.

The grains of carborundum or of electrolite are joined by means of different cements. These cements are of mineral, vegetable or ceramic origin. Those chiefly used are ceramic cements, silicates, melting at a definite temperature. Grinding wheels are produced by the ramming of the abrasives into iron mould and by pressing in the hydraulic presses at a pressure of up to 500 kg./cm.², or by pouring into plaster moulds. The wheels are dried at a definite temperature

in ovens, are roughly turned up on the lathes and are put into the kiln, where they are burned. Burning is very important; at a definite heat the ceramic cement melts and forms after solidification, a solid joint between the grains. The wheels are charged into the kiln in fireclay or carborundum boxes. Charging, burning, cooling and emptying of a kiln occupies about 18 days. The finished wheels are tested on armoured machines at double the speed to that encountered in practice.

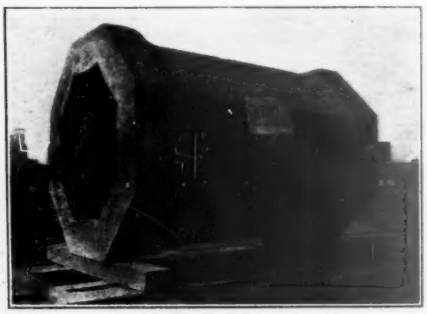


Fig. 9.—Large Ingot Mould made by the Vitkovice Concern.

In Prague not only the works visits, but also the beauty of "this town of a hundred towers," will amply compensate the visitor for the tedious journey it necessitates.

Moravská Ostrava.

This town is reached in 7 hrs. by express from Prague, and forms one town with Vítkovice (Witkowitz). It is situated in the most extensive and important Czecho-Slovakian coal basin. This coalfield is the only one which produces coke of suitable quality for the foundry industry

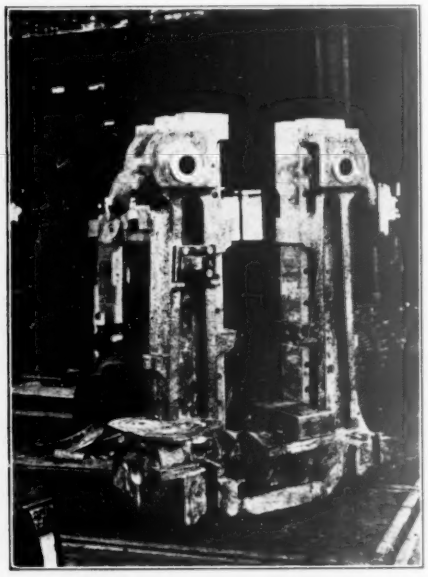


Fig. 10.—A Complicated Steel Casting made by the Trinec Company.

and for blast furnaces. The greatest advantage of this coke is its low sulphur content, which averages 0·7 to 0·75 per cent. This district is the seat of two largest Czecho-Slovakian ironworks, the Vítkovice Mining, Steel and Iron Works Corporation in Vítkovice and the Czecho-Slovak Mining & Iron Works Company in Trinec, situated 30 kilometres from Moravska Ostrava.

Vitkovice Activities.

The Vítkovice Mining, Steel & Iron Works Corporation embraces within its activities coal mining, coke ovens, ore mines, iron and steel works, foundries, engineering works and factory for refractory materials. This corporation employs in normal times approximately 35,000 people.

The manufacturing programme of this corporation extends over a wide range, comprising all kinds of raw materials, pig-iron, steel, coke, coal, refractory material, all kinds of finished products as castings, boilers, bridges, rolling-mill equipment and mining machinery. The engineering works are well known for the construction of the high-pressure steam boiler of the Löffler type. They work at 130-atmosphere pressure and 500 deg. C. temperature. The annual production of the Vítkovice Steel Works approximates to the following figures:—

	Tons.
Pig-iron ... ... up to	750,000
Steel ingots	800,000
Rolled sections	720,000
Steel castings and forgings ...	55,000
Seamless and welded-steel tubes ...	90,000
Grey-iron castings	40,000

(To be continued.)

Fig. 11.—Roll-turning Shop at the Trinec Company's Works.

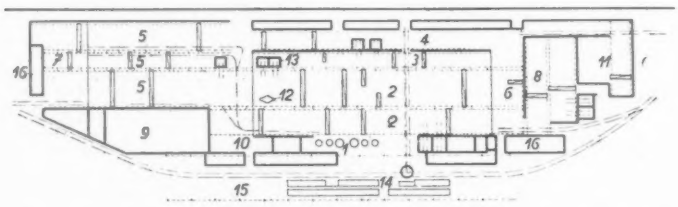


Fig. 12.—Plant of the Grey-Iron Foundry of Skoda at Pilsen.

1—Cupolas. 2—Moulding floor for large castings. 3—Moulding floor for medium castings. 4—Moulding floor for small castings. 5—Mass production section. 6—Fettling shop for jobbing castings. 7—Fettling shop for quantity production castings. 8—Apprentices' department. 9—Core-making shop. 10—Sand conditioning plant. 11—Stores for patterns in use. 12—Electric steel furnace. 13—Drying ovens. 14—Pig-iron stores. 15—Moulding box stores.

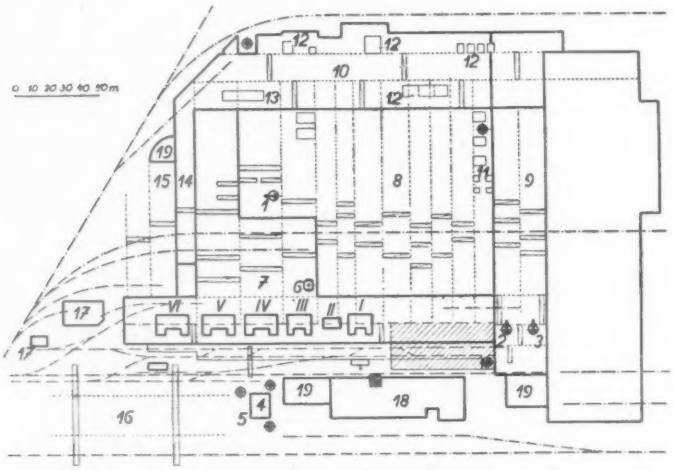


Fig. 13.—Lay-out of the Skoda Steel Foundry at Pilsen.

I to VI—Open-hearth furnaces. 1, 2, 3—Electric steel furnaces. 4, 5—Waste heat boilers. 6—Harmet press. 7—Casting pit for ingots. 8—Moulding shop. 9—Electric steel moulding shop. 10—Fettling shop. 11—Drying ovens. 12—Annealing furnaces. 13—Saws. 14—Pattern stores. 15—Ingot mould stores. 16—Stock yard. 17—Small stores. 18—Gas producers. 19—Offices.

French production quotas for rolling-mill products and sheets are unchanged for the first quarter of 1933, while the quotas for various other products, including hoops, have been considerably increased.

The British Steel Foundry Industry in 1932.

By W. B. LAKE, J.P. (Managing Director, Messrs, Lake & Elliott, Limited, Braintree).

THE returns of the 130 plants reporting to the Department of Commerce show that the production of steel castings in the U.S.A. for the first 10 months of 1932 was 131,039 tons as compared with 352,795 tons for the corresponding period of 1931, a reduction of over 62 per cent.

The figures furnished by the National Federation of Iron & Steel Manufacturers give the production in the United Kingdom for the first 11 months of 1932 as 107,000 tons as against 117,000 tons for the corresponding period of 1931, a reduction of under 10 per cent., so that if these figures are reliable the British steel founders have suffered much less than our American friends. Nevertheless there are few steel-foundry owners who will regret the passing of 1932 as it has been for most of them a period of unrelieved anxiety and difficulty.

Owing to the financial situation very few orders for railway castings have been forthcoming for home or overseas. Shipbuilding has not recovered sufficiently to require anything like its usual quantity of supplies. The publication of the Salter Report has temporarily killed the demand for steel castings for the heavier types of automobiles, and steel castings are in many cases being supplanted by stampings, malleable iron, high-duty cast iron and welded structures.

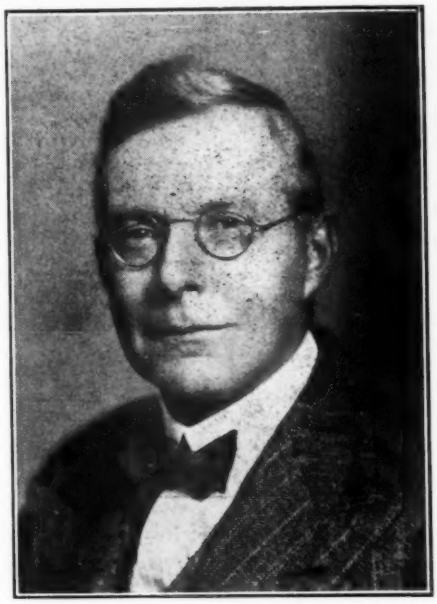
Due to this lack of orders the majority of steel foundries have been running at only a fraction of their capacity, and price cutting has resulted to such an extent that in some cases it is difficult to see how the cost of the bare labour and material can be covered.

In spite of these adverse conditions the feeling in the industry is far from that of despair. The very desperation of the situation, combined with the intimation from the Tariff Commission that the continuity of the tariff on steel castings is dependent on the trade putting its house in order, has resulted in the industry getting together and resolving to put matters on a better basis.

A leading expert has been engaged, and has reported that the first step to be taken to this end is to reduce the superfluous foundries, so that those remaining in the trade shall be able to operate their plants to capacity and thereby reduce their production costs. A scheme has been prepared to enable this to be done which has the support of the majority of the companies engaged in the industry, but as it involves sacrifices on their part, they are not willing to make them while others refuse, who would share equally in the benefits arising. It is hoped, however, that some means will be found to make the scheme universal in its application.

Restrictive Economy.

The necessity for exercising the strictest economy under the present circumstances has rendered the boards of the companies engaged in making steel castings reluctant to expend capital in new plant, and for the same reason the technical staffs have in most cases been reduced to the minimum necessary for performing the routine work, there have consequently been no technical developments of importance during the year. The steel castings trade is severely handicapped in having no scheme of co-operative research, while other branches of the founding industry are well served in this direction.



MR. W. B. LAKE, J.P.

(Hon. Treasurer of the Institute of British Foundrymen).

It is common knowledge that the grey-iron and malleable-iron trades have derived very considerable benefit from the work of the Cast Iron Research Association. The work done by it on sands and melting practice has given its members lower working costs and sounder castings. It has provided them with a new product in the form of heat-resisting castings, and it is largely due to its own work and the information it has distributed that grey-iron castings are now being produced in this country with a tensile strength of from 20 to 30 tons per sq. in., and are finding employment in many cases where steel was thought to be the only suitable material.

TABLE I.—*U.K. Production, Imports and Exports of Steel Castings for years* 1929–1932.

	Production, Tons.	Imports.		Exports.	
		Tons.	Value, £	Tons.	Value, £
1929 ..	166,900	14,156	327,917	1,504	58,934
1930 ..	177,300	12,414	298,528	2,093	83,043
1931 ..	128,700	6,572	130,105	1,093	39,388
1932 .. (1st 11 mths.)	107,000	1,528	29,584	671	28,810

When it can be shown that research has done so much for an old industry like grey-iron founding with centuries of experience behind it, it is reasonable to expect that it can do still more for a comparatively new trade like steel castings, and it is to be hoped that the moment conditions make it possible steps will be taken to start a research association for steel castings or to make arrangements with the British Cast Iron Association to form a department to undertake the work.

The year 1932 has been noteworthy as the first in which the industry has worked under protection, and it is interesting to observe that the value of the imports has been much greater than that of the exports of steel castings, and also that the rise of prices in the home market so confidently foretold by certain political economists is alas too conspicuous by its absence. World conditions make it extremely difficult to forecast the immediate future of the industry, but the author sincerely hopes that the man who writes these notes next year will have a cheerier tale to tell.

The Foundry Industry Month by Month.

(Concluded from page 36.)

November.

DR. C. H. DESCH is elected to Council of the Royal Society

MR. WELDON HANSON is elected President of the Cleveland Institution of Engineers.

MR. WILLIAM REAVEL is re-elected President of the British Engineers' Association.

GERMAN FOUNDRYMEN'S TECHNICAL ASSOCIATION meet in Berlin. Twenty technical Papers are presented.

ANNUAL MEETING of the British Cast Iron Research Association is held in London. Sir Harold Hartley is re-elected President.

December.

SIR HENRY FOWLER is principal guest at London Foundrymen's Dinner.

MR. W. LOMAS celebrates his ninetieth birthday.

SIR HAROLD HARTLEY presides over first Joint Meeting of the London Branch of the Institute of British Foundrymen and the British Cast Iron Research Association.

Calendars and Diaries.

In acknowledging the receipt of calendars and diaries we wish very heartily to reciprocate the messages of goodwill which accompanied them. Messrs. William James, of London Road, Derby, have sent us a wall calendar carrying Heath Robinson illustrations in colour; Messrs. Smith & Fawcett, of Horton Works, Lidgate Green, Bradford, a monthly tear-off calendar carrying illustrations of their shops; Messrs. Grandidge & Mansergh, Limited, of Wheathill Street, Salford, a monthly tear-off calendar; Messrs. Stewarts & Lloyds, Limited, Winchester House, Old Broad Street, London, E.C.2, a desk calendar; Messrs. H. G. Sommerfield, Limited, Charterhouse Chambers, Charterhouse Square, E.C.1, desk diary; Messrs. Ward, J. F. Jones, Limited, Pendlebury Foundry, Pendlebury, near Manchester—wall calendar carrying an illustration of a small girl leaning over the railings at Blackpool—serving as a reminder that this firm specialises in casting such material; Messrs. Crofts (Engineers), Limited, Bradford, a monthly tear-off wall calendar with illustrations of their wide range of products; Messrs. H. Hendra & Son, Townmead Iron Foundry, Beddington Lane, Croydon, Surrey, a monthly tear-off wall calendar with illustration in colour; The Staveley Coal & Iron Company, Limited, near Chesterfield, a pocket diary containing much useful technical data; The Stanton Ironworks Company, Limited, near Nottingham, a pocket diary, including a section of technical information; The British Chilled Roll & Engineering Company, Limited, Empire Works, Haverton Hill, Middlesbrough, a desk blotter and calendar combined; Messrs. Gibbons Bros., Limited, and Messrs. Gibbons (Dudley), Limited, Dibdale Works, Dudley, a desk blotter and diary combined; British & Continental Traders, Limited, Lincoln House, High Holborn, London, W.C.1, a pocket diary; Messrs. John G. Stein & Company, Limited, Castlecary Works, Bonnybridge, Stirlingshire, a pocket diary.

XUM

Refractories in 1932.

By FRANK S. RUSSELL (General Refractories, Limited), Sheffield.

THE experiences of the manufacturers of refractories, whose headquarters are in the Sheffield area, have been in 1932 of a chequered character. In the early part of the year the demand for refractories of all kinds was at its lowest ebb, and monthly sales were, for the most part, of a moderate nature, until the devaluation of sterling and the tariffs, combined during the last three or four months to raise the price of foreign steel and thus introduce into the British heavy steel trade a certain liveliness which was not apparent until the heavy stocks of foreign steel sent over in anticipation of the tariffs have become consumed, the demand for foundry refractories has not, so far, shown signs of a definite improvement.

The home demand for refractories has now definitely improved and sales tend to become normal. Once again it is possible to sell abroad without loss, and some substantial export orders have recently been booked locally. It is a great satisfaction to those who have for so many years advocated the extension of tariffs, to find their prophecies being fulfilled thus early and almost to the letter, and best of all, the improved demand has created a strong undercurrent of confidence in the future, which in a few months will deepen into a general conviction that the dark days of industrial depression are now behind us.

That the worst is now over, and trade is positively on the up grade, cannot be disputed, and there are not wanting those cheery souls who even predict a minor boom in the very near future.

During the year heat insulation has made such definite strides that its provision has now become the rule rather than the exception, and considerable savings are being effected thereby. One large local furnace installation utilised no less than 80,000 insulating bricks in a new construction, and many other substantial orders have been given out during the year. The high-frequency induction furnace has brought to the refractory manufacturer novel problems for solution, but with the help of Mr. W. J. Rees, of the Refractories Department of Sheffield University, they have yielded to intensive work, and excellent lining materials are now being freely sold by Sheffield manufacturers. Silica, magnesite, sillimanite and chrome refractories have during the year been still further improved, and have made considerable inroads into fields previously occupied by foreign-made goods.

Mr. Frank S. Russell
(*Past-President of Refractories Association*).

The lining of the Sesci and Brackelsberg furnaces (a type which daily grows in popularity) have presented unusually difficult problems, but they have been solved with such success that the foreign refractories previously imported are now hardly ever required.

Several of the firms whose produce consists mainly of fireclay goods have been quite busy on specialities, but the demand for ground ganister has been poor and the profits considerably reduced by indiscriminate and regrettable price cutting.

The duty on imported refractory sands and bricks has been of the utmost assistance to British producers in their efforts to supplant foreign goods, and, truth to tell, it has now become almost a point of honour with consumers to "Use British Goods." There are one or two steel-founders who still adhere to the use of imported sands, whilst successful castings are being made all around them in British sand, but the more progressive firms have long ago nailed the Union Jack to their mastheads, and there are many signs that the others will shortly be induced to follow suit, and thus earn the right to invite the public to "Buy British."

Italian Foundry Industry in 1932.

By Dr. GUIDO VANZETTI, Director, Fonderia Milanese di Acciaio Vanzetti, Milan.

WHILE the natural diminution in the output of the metallurgical industry which followed the war years led to a concentration of productive energy and to a natural elimination of the weaker bodies that had come into being during the war, the rapid increase of production, which began with the advent of the Fascist Government, leading to the record figures of metallurgical production in Italy during 1929, caused a number of new foundries to be set up, with the natural result that the entire foundry industry finds itself to-day in a most difficult position. In Italy there are between 3,000 and 4,000 foundries. It may be said that all or almost all the large engineering works have an iron foundry, all the big steelworks a steel foundry. Therefore, both the small foundries, which have very limited overhead charges, and the large concerns, which have a margin of profit in the manufacture of products protected by consortiums or other special conditions, are selling at prices so low as to be absurd. So it may be said to-day that the Italian metallurgical industry is suffering even more from a crisis of prices than from one of work. Control of sales is advocated in some directions for this branch of metallurgy, too, as has already been done with rolled steel; a commission has been appointed to study the problem of steel castings, but it is not thought that its solution will be very easy, on account of the difficulties which are encountered both in fixing production quotas and in establishing prices.

Dr. Guido Vanzetti
(*Director, Fonderia Milanese di Acciaio Vanzetti, Milan*).

Whilst the production of steel castings in Italy during 1932 was less than that of 1931, the drop was not as great as that of from 1930 to 1931. Imports, on the other hand, were reduced to but a few hundred tons. At present in Italy there are about twenty steel foundries, which, as stated, are for the most part departments of the large steelworks. Steel castings in Italy are at present almost exclusively made by electric-arc furnaces with basic lining, the acid lining seldom being used. The high-frequency induction furnace is not yet used in Italy, although the use and manufacture of special steels, heat resisting, corrosion resisting, and with high mechanical properties, have had a certain development in the past few years. The production of high-duty irons, made both with cupola and electric furnaces, has developed considerably. Electric furnaces are generally used for this purpose in plants which are really equipped for the manufacture of steel. There are four or five malleable-iron foundries in Italy, which at present produce about 5,000 tons per year, viz., one-third of total capacity.

Light-Alloy Production.

The production of light-alloy castings in 1932 was between 2,000 and 2,500 tons. It may be said that in the past years the decrease in demand on account of the crisis has been somewhat compensated by a wider application of light alloys. Italy is rich in aluminium, and the

(*Concluded on page* 62.)

The Malleable-Castings Industry in 1932.

By W. EDGAR HALE (Director, Thomas L. Hale (Tipton), Limited).

THE year 1932 has been one of general retrenchment in expenditure, following the economic crisis of midsummer, 1931. There would, however, appear to be reasonable ground for assuming that this era of retrenchment is coming to an end and that industry as a whole is likely to improve somewhat, although, at the same time, it would be indulging in very unwise optimism to visualise in the immediate future any great increase in the volume of business available in industry generally, and especially in the malleable-iron industry.

There is such a host of financial and political problems with which industry is interlocked, and over which politicians have a much greater control than the industrialists, yet, in spite of the industrialists minor control, his interests are of greater importance than those of the politician. There is one factor, however, upon which industry at all times is dependent, and it is upon that elusive state, generally described as "confidence," and happily at the present time, confidence in the future of industry, particularly in this country, is commencing to return. This slight degree of improvement is undoubtedly exclusively due to the change recently brought into being of the fiscal policy in this country, and there would appear, no doubt, that the malleable-iron industry will benefit in the course of time very considerably as a direct outcome of the change in our fiscal policy.

A New Works Projected.

Of recent date it has become common knowledge that a firm, hitherto importing a very considerable tonnage annually of malleable-iron tube fittings, has purchased a substantial property, where it is their intention to develop an organisation for the manufacture of the supplies which they hitherto imported from the Continent, and distributed throughout the British Empire.

Members of the malleable-iron industry at present would, no doubt, have preferred that this business should have been distributed amongst the existing plants now operating, but that, perhaps, can only be regarded as a selfish view, but the real interesting point lies in the fact that a new enterprise is going to be developed which will find employment for British artisans and the consumption of British raw materials.

Malleable Castings for Shipbuilding.

The shipbuilding industry, which in the ordinary course of events consumes quite a considerable tonnage of malleable-iron castings in the course of a year. During this year the consumption has been but a mere fraction of the normal demand. Many of the big yards have actually no work whatever going on.

If the "powers-that-be" could see their way clear to proceed with the completion of the giant Cunarder, that might develop some element of confidence in the future of the shipbuilding industry, for it is the general opinion that the cessation of building activities upon this vessel was brought about by the severe depression existing generally in the shipping world, and that impression has undoubtedly carried much evil in its wake for it destroyed confidence wholesale. There is, however, another phase of opinion in the matter, and, whilst it is substantially an assumption, it is that of fairly recent date many shipping engineers have come to the conclusion that the day of the colossal vessel, for the time being at any rate, is finished.

Engineering practices in the course of their constant advancement have now ordained that the medium-sized ship, say of about 30,000 tons, which can be run at high speeds, is certain to be the popular vessel. That being so, there is no doubt that it accounts more for the holding up of the building of this great ship than the fact that shipping generally is bad, but the sooner this partially-built vessel is either completed or scrapped, the better it will be for the shipping industry generally, which will be reflected in a more normal demand for malleable-iron castings.

Malleable Industry and Agriculture.

The agricultural implement trade which normally consumes a fair tonnage annually has been very hardly hit from almost every conceivable angle. The low prices obtainable for agricultural products throughout the world have so sorely depleted the financial resources of the industry that the capacity of the individual agriculturist to purchase new machinery has been reduced to an exceedingly low order. Here again, however, there is some justification for assuming that at least in some parts of the world agriculturists are commencing to fare somewhat better than they have for some years.

MR. W. E. HALE
(Director, Thomas L. Hale, Limited).

The automobile trade on the whole is continuing to absorb approximately the same tonnage that it has for some years now, excepting in so far as the heavier vehicles are concerned, in relation to which suggested legislation is doing almost irreparable harm. If it is intended and considered advisable that the legislature shall bring into being legislation, which will have any serious bearing upon the activities of road transport, the sooner that it is proceeded with and concluded the better, so that the industry can be settled at the earliest possible date upon the foundation of the newly-introduced conditions.

It is satisfactory to note that the alteration of the fiscal arrangements has encouraged a number of foreign manufacturers of motor vehicles and accessories to establish factories in this country. These new consumers of castings are finding British malleable equal to, and in some cases better than, castings from Continental and American sources.

Electrical engineering also kept up a steady demand for malleable castings, the change over from d.c. to a.c. supplies in several districts and the construction of the National Grid System being of real help in this direction.

Demand on account of heavy general engineering showed no improvement during the year, though some foundries were more fortunately placed than others; in some of the lighter branches, however, trade has been fairly brisk. Here again certain foreign manufacturers have erected factories in this country, and have placed large orders for castings with British founders.

All this has been new business, diverted from the Continent in the face of fierce competition, and British industry has every reason to be pleased with the success of their endeavours in this direction.

Home railways displayed a tendency towards closer association with founders, resulting in an increased proportion of orders for rough castings to be machined in the companies' shops. Foreign railways, though consuming a somewhat smaller total tonnage owing to political and financial troubles, placed the bulk of their orders in this country. Hitherto, a large proportion of their requirements has been supplied ready machined by Continental founders and engineers, but to-day the railways are finding a better and cheaper proposition in purchasing British castings and machining them in their own shops. This should prove to be a valuable addition to our trade when business conditions become more settled.

Malleable ironfounders find their manufacturing difficulties increased each year, and 1932 proved to be no exception. Purchasers demand more and more complicated castings, better finish, smaller machining allowances and lower prices.

Founders do their best to comply with these demands, some of which are bordering upon commercial impossibilities in the light of present-day knowledge, and it is to be hoped that improved methods will be introduced, so that the advance towards greater efficiency in the trade may not be stayed.

There is no doubt that the malleable-iron industry has been suffering to some degree owing to financial stringency in common with almost every other branch of industry, with the result that of recent date there has not been that speeding up of new ideas, and it is to be regretted also that the metallurgical world as a whole, during the year of 1932, does not appear to have paid as much attention to the malleable-iron industry that it is deserving of.

It is to be hoped that this is not an indication that interest on the part of investigators is waning, for there is no doubt whatever that there is still a great field yet to be explored, not only in relation to the improved production of malleable-iron castings, but also into the beneficial usages of the product.

The time has already arrived when malleable-iron castings produced by the best houses in the trade are becoming a serious menace to mild steel forgings and stampings, and as the usages of high-grade malleable-iron castings become better known and better understood by engineering designers, the greater will be their demand in substitution of other metals for reasons of wise economy.

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XUM

Foundry Research in 1932.

By J. G. PEARCE, M.Sc., M.I.E.E. (Director, British Cast Iron Research Association).

THE writer has always felt that the preparation of an annual review would be considerably simplified if it referred not to the year still in progress and, at the time of writing, uncompleted, but to the previous year. The developments of that year have had time to sink into proper perspective and their possibilities can be more accurately gauged. With developments so much nearer at hand, the perspective is not so clear.

So far as the work of the British Cast Iron Research Association is concerned, during the early part of the year some part of the work in progress was interrupted by a fire, which damaged two of the laboratories; and it was subsequently necessary to spend considerable time in the repair and reconstruction of apparatus and equipment, and to make arrangements to carry on under conditions rather more difficult than usual. These handicaps were, however, gradually overcome, and the newly-extended laboratories were ultimately opened in July last by Lord Rutherford of Nelson, and a full account of the opening ceremony was given in THE FOUNDRY TRADE JOURNAL for July 14, 1932. A subsequent visit on the part of the Editor to the laboratories was described, with plans, in the issue for August 4, 1932.

The Cupola.

From the point of view of industrial development, the most striking feature has been the growth of the balanced-blast cupola. In a Paper given to the Birmingham Convention of the Institute of British Foundrymen in June, 1931, the writer stated that not more than a dozen furnaces were in operation at that time. At the present time the number of furnaces in operation and under construction is 28, having a total hourly tonnage of 180. Considering the remarkable difficulties under which the industry has laboured during the past 18 months, this development is very striking. No public statement with respect to the cupola had been made following the above-mentioned Paper until a recent Paper by Mr. H. H. Shepherd, of Ipswich, to the Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen. Those interested can be referred to this. Mr. Shepherd's experience may be briefly summarised by saying that he found a coke economy of 28 per cent., which, with certain savings resulting from diminished patching charges, yielded a total annual saving of about £1,500, the cost of the metal at the spout being reduced in the case of one cupola by 2s. per ton, and in the other by 2s. 3d. The total costs of conversion were recovered in the case of the one cupola in less than seven weeks' operation, and in the other in ten weeks' operation. Other savings due to a great increase in the life of the lining (between two and three times) and to a material reduction in defective castings are also very valuable, although not capable of being expressed in terms of pounds, shillings and pence.

Novel Tuyere Arrangements.

The main tuyeres at the bottom of the wind belt are fitted with screw valves, enabling the tuyere opening to be adjusted to any desired extent. Above these, and in the wind belt, are two or three rows of small tuyeres, capable of individual adjustment to suit the normal working conditions, but not adjustable, or requiring adjustment, during operation. Apart from the regulating valve principle, the whole of the tuyere system, including the number, size and distribution of the individual tuyeres, is the result of careful experiment. The main features are reduced coke consumption, a very high melting zone temperature, and the production of metal comparatively free from oxidation, shown by the absence of excessive sparking or ebullition in the ladle.

Moulding Sands.

Such a review as the present one can, of course, only satisfactorily deal with published information, and on the question of moulding sands attention may be drawn to a very important Paper on sand testing by Mr. W. Y. Buchanan (THE FOUNDRY TRADE JOURNAL, February 11 and 18, 1932). The original experiments were begun with the object of ascertaining whether the suggestions made by the British Cast Iron Research Association with respect to the possibilities of economy in the use of new sand and the improvement in the quality of facing sand could be justified. To use the author's own words, these were "justified to a surprising degree." In addition, however, Mr. Buchanan made a number of extremely useful additions to the technique of both the compression and permeability tests, the official adoption of which by the Association may be confidently anticipated.

MR. J. G. PEARCE
(Director of the British Cast Iron Research Association).

Cast Iron.

On the metallurgical side, two Papers have been given to the Iron and Steel Institute by Dr. A. L. Norbury and Mr. E. Morgan, one on manganese-silicon and nickel-silicon cast irons and the other on nickel-chromium-silicon cast irons. As a result of the first Paper, it was possible to set out for irons containing up to 14 per cent. manganese and 10 per cent. silicon lines separating the various types of structure, ferritic, pearlitic, martensitic and austenitic. In the case of nickel irons, this was also done up to 32 per cent. of nickel, and in addition the diagram shows the region in which the presence of an undesirable element of the structure, probably a free silicide, begins to make its appearance. The second Paper covers the alloy known by the name of Nicrosilal, an austenitic cast iron which has remarkable properties in resisting heat. This alloy is essentially a development of Silal (THE FOUNDRY TRADE JOURNAL, January 14, 1932), from which it differs remarkably in possessing a little ductility in the cold state. The evidence available to date also suggests that it will possess excellent resistance to creep. During the year the industrial application of Nicrosilal has very materially extended, in spite of the disadvantage of its relatively high price. One of its interesting features is a degree of malleability roughly equivalent to that possessed by ordinary white-heart malleable cast iron, and which is developed after an extremely short anneal.

In the Fourth Report of the Heterogeneity Committee presented to the Iron and Steel Institute at its spring meeting, two Papers were presented on ingot moulds for steel ingot, one by Dr. J. W. Donaldson, giving the thermal conductivities of ingot-mould irons, and the other by the present writer and Mr. E. Morgan, dealing with compositions, structures and physical properties of ingot-mould irons. This was the first published information available on the thermal properties of ingot-mould material.

Paris Congress Papers.

Space does not permit extensive treatment of all the outstanding Papers which have been published during the year. Much interest has centred around the austenitic and martensitic cast irons. A very considerable group of Papers was presented at the Paris Foundry Congress, and to attempt to summarise all of them—about forty—is too great a task, but some of the Papers were of great interest and value. One of them, on the use of cement in moulding sand, refers to the manufacture and use of silica sand-portland cement mixture for moulds and cores. The Paper by M. Varlet dealt with the expansion of moulds and cores. There were other Papers on constructions for special cores, and on oil-sand cores in general.

The Polish Exchange Paper dealt with the filling of moulds and the calculations of gates. A most remarkably complete Paper dealt with the whole of patternmaking, moulding and coremaking, with times and costs of operations for the manufacture of an acid-resisting bath or vat. Another Paper dealt with the problems which concern the safeguarding of the casting art against competition from weldings, forgings and plastic materials. A number of Papers dealt with the influence of special elements, such as molybdenum, titanium and titanium-vanadium, and on the special cast irons in general.

Two Papers referred to low-carbon iron from the cupola, the authors having obtained from a receiver-type furnace carbons of 1.7 to 2.5 per cent. The authors found these irons have a very low fluidity and required to be poured at a high temperature. Below total carbon 2.3 per cent. shrinkage cracks were troublesome. For total carbons of 1.7 to 1.9 per cent. silicon content of over 2.3 per cent. was necessary if chilling is to be avoided. With total carbon of 2 to 2.3 per cent., over 2 per cent. silicon is necessary. With high manganese, say 2 per cent., the silicon has to be further increased.

The German Exchange Paper by Dr. Meyersberg dealt with recent developments in Germany, but it is hopeless to attempt to summarise in a few words a Paper which is already a highly-

condensed summary. The Belgian Exchange Paper presented memoranda on testing. A summary was presented of the estimation of oxygen in cast irons, and on the desulphurisation of cast iron by soda ash. An extremely lengthy Paper dealt quantitatively and qualitatively with acid attack on cast iron. There were a number of Papers of interest to those concerned with malleable, with steel founding, and with non-ferrous practice. The British Exchange Paper by Prof. Hanson dealt with causes and defects in aluminium castings. Finally, a Paper by Prof. Portevin summarised the question of the fluidity of cast iron, dealing with all the factors which affect the capacity of a metal to fill a mould, estimated in France by a spiral test-piece.

Statistics.

In a Presidential Address to the Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen, reported in THE FOUNDRY TRADE JOURNAL for October 27, 1932, the writer referred to the peculiar statistical situation in the industry, and to comparisons between the foundry statistics for number of foundries and value of production given in the 1930 Census of Production, and other estimates prepared by the writer. It was suggested that in a normal year the value of the products of British foundries and treated as castings, and considering all types and kinds of foundries, is £40,000,000 per annum, the number of foundries concerned being of the order of 2,000 and the annual tonnage about 2,000,000. During the present time, of course, these figures are not being realised. The Census of Production gave 767 foundries, with a tonnage of 1.1 million tons, and a value of £27,500,000. Having failed to find any means of reconciling the figures of the Census of Production with those from other sources the writer wrote to the Board of Trade asking for any light which they could throw on the subject. The Statistical Department of the Board replied in a letter dated November 2, which they subsequently approved for publication. As this letter is of great interest it is reproduced in full:—

"I am directed by the Board of Trade to thank you for your letter of October 12, and to say that the figure of 767 establishments shown in the Preliminary Report on Iron and Steel Foundries relates, in the main, to those firms whose principal business in 1930 was the production of cast-iron goods for sale. It is known that, in the engineering and other metal-using industries, a large number of firms make the castings which they require for the manufacture of some more finished product, and though a number of the larger firms of this kind are able to furnish separate returns in respect of their foundries, it was found impracticable to require similar information from all such firms. Consequently, the number of establishments covered by the report is probably substantially smaller than the number of foundries actually in operation in Great Britain in 1930, even when allowance is made for the omission of firms employing ten or fewer persons, and of those from which returns were outstanding at the time of publication of the report.

As regards the output of foundry products, I am to point out that the value of £25 million to which you refer is inclusive of items aggregating over £6,000,000, in respect of which the tonnage was not stated. In the final Report on the Census it is hoped that exact data in regard to the aggregate weight of these items may be available, but on the basis of the usage valuation taken from your own estimates, it would appear that their weight may have been not less than 300,000 tons, raising the weight of all foundry products recorded in the report to 1.4 million tons.

In addition, engineering firms that did not furnish separate returns relating to their foundries recorded an output of iron and steel castings valued at £2,515,000 (Preliminary Report No. 13, published on January 9), and smaller amounts were also recorded under this heading by firms in other metal-using trades. These items, however, represent castings sold (or added to stock at the end of the year) and do not, as already stated, include castings used for further manufacturing purposes by the makers.

For the reason given, the attempt to isolate the foundry industry could be only partially successful, but, as you suggest, the extent of the deficiency in terms of output is probably considerably less than might be indicated by a comparison between the number of foundries covered by the report and the number believed to be in existence. You will observe from the footnote to the table headed "Production," on page ix of the report, that the deficiency is believed to affect railway material, engineering castings, and miscellaneous castings. The output recorded in respect of the specific classes of castings mentioned in the table at the foot of the same page (Production, Exports and Retained Imports) is believed to be substantially complete.—I am, sir,

Your Obedient Servant,
H. LEAK (signed).

Bronze Founding in 1932.

By FRANCIS W. ROWE, B.Sc., M.I.M.M., etc.

THE year 1932 cannot be looked back on by the bronze founder with any particularly glowing feelings. For most people it has been a year of constantly diminishing markets and thus output. Restriction in the volume of business available naturally means greater competition, and this, coupled with lower output and fixed overhead charges, accounts for sadly-reduced profits.

Modern conditions are not such as when one can hope to see extensive installation of new modern plant or witness striking developments of new methods. New plant and new methods are very often the result of a desire to meet a demand for increased output as well as for a desire to reduce costs. Since nowadays it is extremely difficult to find means of disposal of increased outputs, and the low volume of business available to the British engineering trades, can in very few instances be ascribed to high costs—or at any rate that portion of the costs which lend themselves to appreciable reduction by means of new plant or new methods—it will be seen that the incentives to scrap old methods and old plant are by no means so strong as in normal times.

Nevertheless, the past year has seen some distinctly progressive steps in bronze-foundry practice, and has seen some distinct crystallisation of ideas which will certainly bear fruit to clear-thinking founders when the long-delayed return to normal trading occurs.

Perhaps one of the most noticeable features in 1932 has been the appreciation by most bronze founders of the necessity of maintaining and improving quality of product to keep a hold on the market and the gradual, but sure, education of the buyer in this respect. In the production of bronze castings, high quality and soundness

MR. F. W. ROWE, B.Sc.

of product are no longer mere selling aids to obtaining a good price, but are an essential to securing work at all.

Better Quality Castings.

The writer would definitely state that, taken by and large, the quality of product being turned out by the bronze founder to-day is superior to that ever produced in previous years. The necessity for designers to pare costs has naturally resulted in lighter castings and increased stresses, so that only those non-ferrous castings made from good raw materials under carefully-controlled conditions are likely to give reasonable service. The days when the mediocre casting had every chance of giving a useful life are rapidly passing.

Lowered Melting Costs.

Apart from this gradual, but very definite, improvement in quality which is taking place, there have not been a great many notable landmarks of progress in 1932. There has been, however, a noticeable tendency to abandon, on the score of high cost, the older methods of crucible melting for non-ferrous alloys. A similar and probably larger abandonment of crucible melting has, of course, taken place in the melting of high-grade steels such as high-speed steel and carbon and alloy tool steels. In high-speed and tool steels the crucible coke-fired crucible furnace has been replaced by the high-frequency induction furnace, whereas in the non-ferrous founding industry the reverberatory or non-crucible type oil-fired furnace has been the one chiefly installed.

The basic disadvantage of the crucible furnace is the high cost of melting. Whilst it is universally recognised as giving a high-quality product, the low output and low thermal efficiency render it non-competitive against more modern methods, particularly in these times where every item in the final cost must be closely scrutinised. Primarily developed for the simpler gunmetals and bronzes, the non-crucible type furnace has now been found adaptable to practically all the commoner non-ferrous alloys, including high-tensile brasses and alloys bearing up to

20 per cent. nickel. There are three points on which this type of furnace holds advantage over the crucible type:—(1) The thermal efficiency is higher and therefore the fuel costs are lower; (2) the cost of crucibles is eliminated, and (3) the melting is faster and therefore a higher output is obtainable from similar-sized units.

As regards the first point, the thermal efficiency of a good oil-fired non-crucible type furnace on anything like full production should be round about 16 per cent., whereas a crucible furnace seldom shows more than 6 per cent. This in actual practice gives a saving of from 4s. to 6s. per ton of metal melted.

Regarding the second point, the cost of crucibles in the most efficiently-run foundries is seldom less than 7s. per ton and in many instances is normally as high as ten or twelve shillings per ton. Admittedly, all this cost is not definitely eliminated, as with the non-crucible-type furnace, to secure anything like good and efficient results, the lining must have regular and careful attention. But, taking an unprejudiced standpoint, this should not account for more than one-half the cost of crucible and possibly less, so that the balance is in favour of the non-crucible type on this score.

On the third point. A high output from a 400-lb. crucible furnace is 6 heats per 8-hr. day on gunmetal; from a similar-sized oil-fired reverberatory furnace working on similar charges, 12 heats are quite possible and 10 heats regularly obtainable. There has been, and still is, some controversy as to the respective merits of the metal produced from the two types of furnace, but the writer can say from his experience that equally good and satisfactory metal can be produced from the non-crucible furnace as from the crucible furnace provided the necessary care is taken. Admittedly, more care is necessary and experience must be gained, but an ultimate possible saving of from 10s. to 25s. per ton in melting costs is worth while.

Induction Furnaces.

The high- and medium-frequency induction furnace has also been installed by one or two progressive firms who are particularly interested in the melting of high-melting-point non-ferrous alloys for castings. This method of melting, whilst involving a very high capital expenditure for the necessary plant, shows a distinct overall economy and an improved product for high-melting-point alloys such as the high-nickel-chromium and other complex alloys used for corrosion- and heat-resisting purposes. One firm which has installed one of these furnaces for melting a special alloy for corrosion- and erosion-registering purposes at high temperature and pressures estimates that the melting costs have been reduced 28 per cent. by altering from coke-fired crucibles to induction-furnace melting.

So far, however, neither the high- or low-frequency-induction furnace nor the arc-electric furnace has seemed sufficiently attractive to warrant installation for the melting of gun-metals and bronzes for castings. This possibly seems strange in view of the large use of the low-frequency furnace in the billet trade for rolling and the popularity of the arc furnace in the U.S.A. for bronze-foundry work. The drawback to the type of furnace used in the brass-billet trade is the necessity for continuous working, and to the rocking-arc furnace largely used in the States is the fact that it utilises single-phase supply, an unpopular type of load with most power stations in this country.

Influence of Cheap Virgin Metals.

The effect of low raw-material prices has not been without its indirect effects on the non-ferrous founding industry. Whilst it must be faced as an economic fact that secondary metals, or in common parlance "scrap," must of necessity find an outlet, there has been a great tendency in the past for these to be used too much in the bronze-founding industry. The low prevailing prices for copper, tin, lead and zinc have therefore not been without their beneficial effect on the quality of bronze castings produced during the current year. When metal prices are high, the margin between raw metal and scrap widens, and there is a greater incentive to use a larger proportion of scrap in the charge by bronze founders who think too largely in terms of price. The present margins between scrap and new metal are such, however, that most bronze founders have wisely decided that the greater risks and less chance of securing high-grade castings attendant on the use of scrap make it not worth while. Thus, most supplies of secondary non-ferrous metals are being wisely diverted into channels where more correct use is made of them—namely, the refiners.

The low price prevailing for tin has also had a marked effect on the progress of alloys designed to give properties similar to the high-tin gun-metals, but not utilising tin. When tin stood round about the £300 per ton mark, alloys not employing this element were carefully investigated and developed. Notable amongst these were copper-silicon-zinc alloys, which showed a marked economy over the gun-metals then. Since tin fell to £110 per ton and appears now to be steadily maintaining the £150 mark, such alloys show very little economy, particularly when the increased difficulties of founding are taken into consideration.

FIG. 1.—TYPICAL CORE WEIGHING 19 LBS. MADE ON THE AUGUST'S BORRMANN CORE-BLOWING MACHINE.

New Equipment.

Core- and mould-drying equipment and sand-handling plant generally has registered appreciable progress in 1932, and this is a phase of bronze-foundry practice where modern methods are more generally appreciated and prevalent than formerly. The necessity for perfectly-prepared sands to secure uniform and sound castings and the need for even and regular drying with the same object is recognised. Moisture and permeability testing of sands is gaining ground in the same way that casting-temperature measurement gained ground ten years ago, and bids fair to become as universal in a few years as pyrometric measurement of metal temperatures is to-day.

On the non-ferrous founding side the Institute of British Foundrymen is doing useful, if unostentatious work. The Non-Ferrous Sub-Committee has been active during the year in clearing away some of the dead wood in the way of progress and is formulating specifications and recommendations which should prove of distinct assistance to both makers and users of bronze castings. In referring to specifications, the writer would like to call all founders' attention to the new B.S.I. specification on the pattern colours, and urge its speedy adoption even to existing patterns, as it is only by the universal adoption that such specifications can be of benefit, and this is surely one on the value of which there can be no difference of opinion.

In the equipment field for the bronze founder, as well as the ironfounder, the further development of the core-blowing machine is of interest and possibly great value, particularly to those engaged on the production of repetition cores. There are several types on the market, and the author's mention of the August-Borrmann machine must not be construed as other than being a particular make of which he has some knowledge. This machine, which has certainly one distinct advantage over others investigated a few year ago, in that it will handle very heavily-bonded sea sands successfully, operates from a 100-lb. air line, and on quite intricate cores of medium size is capable of a production of 6 cores per min., given sufficient operators (3) to keep the machine going continuously. For anyone who has quantities of small- and medium-size cores to make, this type of machine is well worth investigating.

Centrifugal Castings.

Progress in the application of centrifugal casting of non-ferrous alloys has been made both in applying the process to large and more varied types of castings and to newer alloys. Besides its application for tail-shaft liners and similar-shaped castings and to gear-wheel blanks, it is now very largely used for water and steam valve rings and seats, and sliprings for A.C. motors and converter work. The firm of David Brown & Sons (Huddersfield), Limited, have developed a large type of vertical-axis machine capable of spinning castings up to 30 cwts. in weight and a product of this machine, a bronze rim weighing over 2,000 lbs., was recently shown in this journal.

New Alloys.

Production of new alloys or at least new combinations has not been lacking and even having in view the possible ephemeral nature of some of these several appear likely to gain a definite position for the respective duties for which they have been designed. One of our oldest and largest bronze foundries has developed a corrosion- and erosion-resisting alloy which is likely to be of great value in service, particularly in view of the high physical properties it possesses in the cast state.

The extended use of nickel as an addition to many of the commoner bronze alloys is taking place. In particular must be mentioned the leaded phosphor-bronzes used extensively for bearings. Here the benefit of from 1 to 3 per cent. of nickel in reducing grain size, securing more even distribution of the free lead and thus increasing roughness is being recognised. Attention has been focussed during the year on to the subject of the testing of castings, and, while much controversial argument still abounds, the light that is being thrown on to the subject from various angles and by various authorities is all to the good.

The writer very definitely feels that 1932 has not been a wasted year, and that the close investigation of costs and at least tentative exploration of new plant and new methods and the necessity of improving quality to keep a hold on the market will bear good fruit in the future. For those who are confident they are holding their own at the present, 1933 can be looked forward to with confidence. Most people, even without a good deal of delicate intuition, feel that the last weeks of the old year have shown not inappreciable brightening of prospects, and, though the struggle for some time will undoubtedly be severe, the ultimate reward of those who have stayed the pace and endeavoured to keep abreast will not be long delayed.

Metallurgical Developments in Railway Foundry Practice.

By E. MILLINGTON (Chief Metallurgist, London Midland & Scottish Railway Company).

THE purpose of the present article is to outline recent developments in the reclamation and use of scrap in the foundries of the London Midland & Scottish Railway Company. Prior to the grouping in 1923, each railway had one or more foundries which, of course, operated quite independently. When the London Midland & Scottish Railway Company was formed, great divergences in foundry practice were naturally revealed. These divergences were gradually overcome, but up to 1931 there were still two sections operating foundries—the "Locomotive" and the "Carriage and Wagon." In 1931 these two sections were combined under the Chief Mechanical Engineer, and the possibility of co-ordination greatly increased.

At this time it was found that in the non-ferrous section there were some 55 different mixtures in use. This number has now been reduced to 14, and it is eventually hoped to reduce the number still further. In the cast-iron section the original number was 33, and each foundry had its own mixture for the same class of work.

Standardisation and Economies.

As the process of co-ordination and standardisation of mixture grew, it was found that important economies could be effected in the case of raw materials by reducing the number of items to be purchased and stocked, and by the better utilisation of scrap. An important factor brought to light in this investigation was that under existing conditions the quantity of scrap available was much greater than could be satisfactorily utilised, so that a considerable surplus had to be sold. It was realised that large savings would result if the use of scrap could be extended sufficiently to avoid the necessity for selling any of it. Steps were therefore taken to ensure that an output should be obtained approximately equal to the amount of incoming scrap, less melting and other losses.

Taking cast iron in the first instance, in railway work the bulk of the castings consists of cylinders and components requiring a similar quality of iron, axleboxes, chairs, brake blocks and firebars. Mixtures for cylinder metal have varied considerably in the past from foundry to foundry, but an average mixture over the whole of the foundries consisted of 55 per cent. pig-iron and 45 per cent. scrap. The cost of the mixtures varied over a wide range. As the result of research, it has been found that cylinder scrap, which was formerly sold, could be renovated and brought into such a condition as to be comparable with virgin pig, and further research on the use of this refined iron in conjunction with scrap showed that the results were highly satisfactory and resulted in considerable economy.

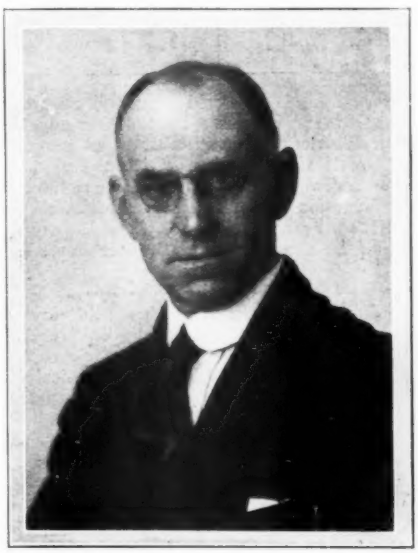
High Scrap Burdens.

For carriage and wagon axleboxes the previous standard mixture included about 74 per cent. scrap, whereas it has now been found possible to increase scrap up to 90 per cent. Here, again, the necessary mechanical properties have been amply met, and the casting of the metal is in no way inferior to that of the old mixture.

Perhaps the most intricate problem has been that of the use of an increased quantity of scrap in rail chairs. Early trials showed that, beyond a certain percentage of scrap, indifferent results were obtained. The reason for this limitation has now been discovered, and 90 to 95 per cent. scrap is now used with excellent results, together with 5 to 10 per cent. of a special pig-iron to make up the balance.

Difficulty was also experienced initially in the use of increased quantities of scrap for brake blocks, due to certain causes arising from temperature of the melt and methods of moulding. These difficulties have been overcome, with the result that 90 per cent. scrap is now being used. In the case of brake blocks, however, the inevitable loss of metal in actual service, due to wear, brings about a deficit which has to be made up from some source other than scrap brake blocks, and it is proposed to employ certain miscellaneous scrap previously considered to be of little value. Hardness is an important factor in brake blocks, but the necessary condition is met by adjusting melting conditions and using a suitable class of pig.

The scrap arising from firebars is of an inferior quality, difficult to deal with in the cupola.



MR. E. MILLINGTON
(Chief Metallurgist, L.M. & S. Railway Company).

The sulphur content is high and the manganese low, thus giving rise to a white hard iron if too much scrap is used. The only alternative is to desulphurise the scrap and renovate it into a suitable condition for use. Experiments suggest that this can be done satisfactorily.

Importance of Scrap.

The examples mentioned above by no means account for the whole of the iron consumed, but sufficient has been said to indicate the importance of scrap iron to the company, and the economies which can result from even small increases in the percentage used in the different mixtures. As Sir Harold Hartley pointed out in an earlier contribution to THE FOUNDRY TRADE JOURNAL, the physical properties of cast iron can be controlled, and even predicted, provided that conditions are suitably arranged, and by careful temperature control, as well as by the use of a special class of pig, it has been possible to achieve the results described above.

It is probable that, with the exception of cylinder metal, practically all the requirements of the foundries can be met with one class of pig-iron, in which silicon and manganese play an all-important part, in conjunction with the appropriate type of scrap for each purpose. Such a simplification is of obvious advantage both in the foundries and to the purchasing department.

Cupolas to be Improved.

Mention should be made of the part played by the cupola. As with the mixtures, cupolas differed widely in detail at the various foundries, giving rise to different coke consumptions, etc., per ton of metal melted. Attention to various working details and control has led to a more uniform standard of performance, and has allowed the increased use of scrap. Further investigations on cupola design are still in hand in conjunction with the British Cast Iron Research Association.

Non-Ferrous Developments.

Owing to the expensive nature of the raw materials entering into non-ferrous alloys, the increased use of scrap in this field is of equal importance, and similar investigations have been made. Considerable difficulties arose owing to contamination of scrap with other alloys during machining operations and in collection and storage. A well-arranged system for collection and storage has now been instituted, which has largely overcome this difficulty. Another difficulty lay in the fact that the mixtures in use on the constituent companies differed from those which it was desired to standardise, and the extent to which these different mixtures were still in use had to be determined so that the scrap arising could be adjusted to within the range of the standard alloys. Difficulties also arose in melting down turnings and borings, owing to the different melting losses and amount of renovation required. With proper control, however, little difficulty now remains in combining the various elements to meet the composition and physical properties required.

A review of melting methods has resulted in the whole of the scrap being used, and whereas formerly about 65 per cent. was employed, the figure has now reached 90 to 95 per cent. This conclusion is satisfactory not only on economic grounds, but the alloys now made fully meet the mechanical properties desired.

Anti-friction alloys form an important feature of the metallurgical work of a railway company, and troubles arise similar to those referred to in the case of brasses and bronzes. Here, again, similar methods have been applied to ensure different classes of scrap being kept uncontaminated, and in the subsequent renovation of the scrap. The success of this work is largely due to the fact that a continuous supply of scrap of fairly uniform character, and of known history, has been available.

Co-operative Efforts.

Although the work described refers mainly to metals and their uses, this forms only one section of the many branches under investigation. Moulding sands, cupola refractories, coal dust, blacking and other foundries' accessories have been, or are, the subjects of investigation and co-ordination which has resulted in simplification and improvement in manufacturing methods and large reduction in manufacturing costs. With regard to the methods of moulding adopted in the various foundries, both hand and machine methods are in use. Generally the practice adopted in each foundry has been the result of carefully-thought-out methods, full use being made of machines wherever possible to perform the complete moulding operation. The

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The Light-Castings Industry in 1932.

By W. R. BLAIR, M.C., M.A., LL.B. (Chief Executive Officer, British Ironfounders' Association).

WHILE the writer recognises and appreciates the honour conferred in asking him to contribute such an article, he does not find the task altogether congenial, inasmuch as there is very little of an encouraging nature to record.

The chief characteristic of the industry during 1932 has been the unintelligent and almost unintelligible effort evinced by practically all engaged in the industry to get rid of their products at any price, quite irrespective of the costs of production, with the result that in the class of goods in common use for housing-scheme purposes, prices during the year fell to a level approximating those obtaining during the years 1908, 1909 and 1910 before the National Light Castings Association came into being.

It is true that so late as November an effort was made to put an end to this frenzy of price-cutting, but the level to which prices had previously fallen was such that even the so-called stabilised prices in no way represent an economic return to the manufacturer. It has also still to be demonstrated whether that effort will be permanent in its effect, but this statement is, in any case, rather anticipatory.

Export Trade.

There are several prominent and well-known factors which have conduced to the orgy of price-cutting witnessed during 1932. Of these, certain are beyond the control of the light-castings manufacturers, and their solution must, therefore, wait their own appropriate time and season. There are, however, other factors which

Exports of Cast Pipes and Fittings from the United Kingdom for the last Eight Years.

Year.	Tons.	£
1925	94,251	1,348,900
1926	86,984	1,148,758
1927	122,823	1,495,251
1928	114,189	1,321,662
1929	136,107	1,455,202
1930	116,305	1,294,041
1931	72,776	804,930
1932	65,635	671,439

are within the immediate control of those engaged in the industry, and it has been in that direction that the thought and energies of the industry have been directed during the past year.

Whilst the causes of world economic conditions may be obscure, their effects on the light castings industry, in common with other industries, are, unfortunately, only too obvious. In past years, export trade has represented a very substantial volume of business, and has to that extent relieved pressure on the home market. As a result of the financial confusion and in-

Exports of Builders' Castings from the United Kingdom for the last Eight Years.

Year.	Tons.	£
1925	19,141	873,761
1926	19,668	882,118
1927	17,929	829,644
1928	19,682	876,745
1929	20,522	928,274
1930	17,852	796,865
1931	13,972	620,457
1932	10,536	442,894

stability created by world economic conditions, increased tariff barriers, import licences, absolute prohibitions, and difficulties of exchange, have, practically speaking, written *finis* to the export trade of the light-castings industry. The production which formerly found an outlet abroad has, as a consequence, been largely concentrated on the home market.

Free State Business Lost.

The dispute with the Irish Free State has also had unfortunate reactions on the light castings industry. There are very few light-castings foundries in the Free State, and practically all their requirements were as a consequence derived from foundries in Great Britain. The policy of the Free State Government has, since the dispute with Great Britain took place, been to exclude British products and to encourage goods of Irish manufacture. To this end, a tariff was imposed in May, 1932, which tariff was considerably increased in July. The effect of this policy has again been to drive the British, and particularly the Scottish, foundries from what has long been a favourable market for their goods, with similar consequences in the direction of further concentrating home production on the home market.

During the boom years immediately succeeding the war, many new starts were made in the light-castings industry, and as a result, the potential productivity of the industry is much in excess of the possible requirements of the home market. The reduction of the export trade and trade with the Free State to negligible proportions have further accentuated the difficulty, and it is, therefore, perhaps not surprising that during 1932 there has been rather an unseemly scramble for such orders as were available.

So far as the home trade is concerned, however, there is not, and never has been, any good reason why prices should not have been stabilised at a reasonably economic level. That end, however, can only be attained by each founder being prepared to subordinate his individual freedom of action to collaboration with others in fixing an economic level of prices to be observed and maintaind by all.

It will be remembered that during many months of 1931, a Committee of Ironfounders was engaged in negotiation with the distributors of the country for the adjustment of an agreement for the maintenance of prices at an economic level, and that such an agreement was eventually drafted. During the negotiations it had been made a condition precedent to the operation of the agreement that the support on the ironfounders' side should represent 100 per cent. of the important ironfounders of the country. At the time the agreement was drafted there were a considerable number of important ironfounders who had not in any way indicated their willingness to observe the terms and conditions of any such agreement, and accordingly that section of the industry who were satisfied as to the necessity for such an arrangement had to direct their efforts towards securing the necessary additional support.

One Dissentient.

Every ironfounder in the country was approached, and in the case of those whose support was considered essential arrangements were made for their being interviewed. These individual negotiations were necessarily protracted, and it was not until September, 1932, that the Ironfounders' Committee was in a position to present a report to the Joint Conference of Manufacturers and Merchants who had negotiated the draft agreement. Unfortunately, while the effort met with a very substantial measure of success, the Ironfounders' Committee had to report their inability to secure the adherence of one founder whose co-operation it had been agreed was essential to the successful operation of the agreement. However absurd it may appear to have to say so, the abstention of this one founder stultified all progress, and resulted in an indefinite adjournment of the negotiations with the merchants of the country.

Price Stabilisation Scheme.

During these months of negotiation with individual founders, price levels had continued to fall, and when the breakdown of the negotiations with the merchants became known, the fall, which had hitherto been more or less gradual, immediately became abrupt. The immediate effect was that the situation became so critical as to threaten the continued existence of the manufacturers' association. Indeed, it was openly stated at a meeting of the manufacturers' association in October that unless something was done not only to stay the fall in price levels but to secure an immediate increase, certain ironfounders, who along had given their unqualified support to the association would immediately withdraw from its membership. In these circumstances, it was suggested that before any such action was taken time should be afforded for a committee of the ironfounders to formulate and present some scheme which might not only provide a means of attaining the end of stabilised prices but might be such as would commend itself to the ironfounders of the country. Such a scheme, known in the industry as the ironfounders' "price-stabilisation scheme," was formulated, presented to, and adopted by a general meeting of ironfounders early in November.

As there has been a very considerable amount of misunderstanding, not only of the motives which actuated the ironfounders in adopting such a scheme, but as to the ends which it was intended to serve, I think it is appropriate that I should add a few words hereby way of explanation. The primary motive actuating the formulation and adoption of the scheme was the preservance of the ironfounders' organisation. The ends which the scheme was intended to serve were in the first place the prevention of any further drop in price levels, and in the second place to provide a starting point from which,

Metallurgical Developments in Railway Foundry Practice.

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machines used include jolt rammers, hydraulic, pneumatic as well as hand operated. A rapid output has been obtained of good-quality work at an economical price, but investigations are proceeding with a view to obtaining a further improvement in the output by greater concentration of some of the classes of work in each foundry and improved methods of handling foundry materials and products.

Research work on the London Midland & Scottish Railway Company is organised under one control, and the Research Department is closely associated with outside organisations, such as the British Non-Ferrous Metals Research Association and the British Cast Iron Research Association. In many cases trials on behalf of these associations are carried out and developed in the railway workshops. The amount of individual and combined research now in hand reaches considerable proportions.

subject to the necessary support being obtained, negotiations for a fuller scheme of price maintenance with the merchants might be renewed. It has never been either pretended or intended that the ironfounders' "price stabilisation scheme" was more than a step towards the end of inclusive price maintenance. Indeed, it was recognised from the outset that unless the scheme was supported by the ironfounders to the extent necessary to enable a further early approach to be made to the merchants of the country, it could not for long continue in operation.

Since the scheme was adopted early in November, every possible step has been taken to secure the necessary additional support, but, unfortunately, that effort has failed at exactly the same point and in the same direction as did the previous effort. A full disclosure of the position was issued at the end of the year to all the merchant organisations in the country, and in conveying that information I stated, on behalf of the ironfounders supporting the scheme, that they were prepared to resume negotiations and go forward with a full price-maintenance arrangement if the merchants on their part were of a like mind.

Bath Manufacture.

There is one section of the industry upon which I have not hitherto touched, and that is the bath section, which affords a rather brighter prospect than does the trade in general. The organisation of the bath industry has proved somewhat easier in respect that there are not many founders engaged in that section. At the same time, whilst suffering from exactly the same disabilities as applied to the general trade, arising out of world conditions and diminished demand, the bath industry has been further subject to the difficulty of foreign importation. A certain measure of protection against such foreign competition has already been given, but it has proved inadequate to stem the influx of baths, which have continued to be imported in numbers and at prices which are still a source of considerable upset and alarm.

In November, 1931, the British Bath Manufacturers' Association was constituted, and prices were fixed, which, on the whole, have been faithfully observed during 1932. The full effect of the improved prices has been detracted from by the existence of considerable contracts on hand at the beginning of the year, but the benefit to the industry has been undoubted, and is unanimously acknowledged. There have been certain internal and domestic difficulties which have been the subject of a great deal of thought and negotiation throughout the year, but these, I am glad to say, have now been successfully overcome, and the prospects for 1933 are, so far as the bath section of the industry is concerned, much brighter than they have been for a number of years past.

The Future in the Balance.

To revert to the position of the general trade, the writer is not at the moment in a position to say what the outcome of the communication addressed to the merchant organisations will be, but the immediate prospects are very uncertain and not at all reassuring. It is difficult to appreciate the point of view of those founders who prefer to pursue a strictly individualistic course, unless it be that they hope to be left in the enviable position of having prices controlled for them without themselves being subject to control. The time is, however, past when in any industry one manufacturer can live to himself, although it would appear as if it may be necessary for that lesson to be driven home by a further sojourn in the hard school of experience. Such an education is costly to acquire, unfortunately, not only to the instructed, but to the instructors. The opportunity now presented of improving the deplorable condition of prices in the light-castings industry and establishing these once again upon a sound economic basis, if not now taken, may not occur for some considerable time to come, but nothing can be surer than that, sooner or later, and probably sooner rather than later, adversity will compel co-operation along lines similar to those now available.—*Experientia docet stultos.*

The Belgian Steel-Foundry Industry in 1932.

By G. FOSSEPREZ (Managing Director, Nouvelle Société des Aciéries de Mons).

THE year which has just lapsed has been the worst which the Belgian steel-foundry industry has ever known. Bad enough in 1931, the position has become critical in 1932, and the urgent need of radical decisions has become apparent to everyone entrusted with a measure of responsibility. It may be said that Belgium was the cradle of the steel foundry. During the quarter of a century that preceded the war, the Belgian steel foundries developed an immense activity and created important markets abroad. They had nursed and trained skilled labour, and the productivity of these men, together with a general internal organisation favouring intensive production, were no doubt the primary causes of this success.

The war brought about many changes. Commercial difficulties increased through the raising of tariffs in many countries abroad, and one might have thought that in the presence of these impediments the foundries would have striven towards modernisation of plants and methods. In some respects this modernisation has taken place, as, for instance, in the development of machine moulding, but the effort on the whole has been completely out of proportion with the needs. Perhaps this has been due to the fact that among the original steel founders were a number of old iron founders, who inculcated to the newer generation methods based on their old trade, but also the conservative spirit associated with it. The development of the Belgian steel foundry in post-war days has followed far too large an extent this empirical basis, and too great reliance is being placed even now on local advantages, such as the quality of labour and the proximity of excellent moulding sands to keep up the prosperity of the industry. In neighbouring countries decidedly greater efforts have been made towards scientific progress, whilst the Belgian foundries, generally speaking, have rested on their laurels. How could it be otherwise, if one bears in mind that up till quite recently the leading staffs in the foundries included very few men with proper scientific training.

The larger steelworks with foundries attached were among the first to understand to the full extent the necessity of laboratory control and research. The steel foundries as such have been very slow to follow, and even now the majority

MR. G. FOSSEPREZ
(*Managing Director, Mons Foundry Company*).

of independent steel foundries are not working with the close laboratory control which the production of steel castings for present-day requirements demands. The larger steelworks, possessing steel foundries, had put in charge of these departments properly-qualified technicians, who had specialised in the particular task entrusted to them; they brought to their work more independence of mind, and they were the first to discard what had become obsolete in the old methods; on the whole, success has attended their efforts. Abroad, the striving towards better products has been far more pronounced than here, and a good many amongst us are to-day surprised at the position which has arisen. For instance, the production of alloy-steel castings has taken in neighbouring countries an extent which is completely unknown in Belgium. The Belgian foundries, with their side-blown converters, have no longer the equipment required to emulate the quality and variety of product made abroad.

Some of the more important steel foundries have begun to realise this, and several have declared their intention to install new melting plants. Yet, so far, it cannot be said that in this country there has been the same striving after modernisation of plant, methods and products as has taken place in other European countries. Even some of our plants for preparing and distributing sand are hopelessly behind the times. The labourer still looms far too big in the picture of the Belgian steel foundry. Intimate and immediate knowledge of costs is in too many instances a necessity which is insufficiently grasped.

In 1932 the competition, which was always exceedingly strong between the various foundries, has become utterly absurd. It has reached the paradoxical position that castings which were designed to be made in iron are nowadays ordered in steel because they can be bought cheaper in this metal! Altogether, there are 29 steel foundries in Belgium. Some are quite small, some are departments of a large steelworks or engineering shop, some are capable of producing as much as 2,000 tons of castings per month. They all retain to some extent the advantages which have enabled their rapid development, namely, the highest grade of labour and local supplies of raw materials necessary to their operation. But hardly one of them can claim to possess absolutely modern equipment,

and most of them are still working in what to-day may be called a very primitive way.

Before the war the foundries specialising in repetition work had come to an understanding with regard to sales prices for certain classes of work, as, for instance, railway work. The number of foundries capable of producing this class of castings has, however, increased since the war, and it became more difficult to maintain the understanding. Price arrangements were renewed for a time, but have since fallen through, some of the larger producers having preferred to try to eliminate the competition of the other firms, although so far there has been no sign of this. Various attempts have been made to renew the price arrangements, but they have not succeeded, and the competition is fiercer than ever since increased tariffs in various countries have intensified the difficulty of filling the order-books.

The Belgian steel-castings industry is really at the cross-roads. They must produce better qualities, eliminate antiquated methods, resolutely modernise their plants, both to cheapen the product and to adapt it better to fulfilling the newer needs of the engineering industry.

Markets have been lost, new markets must be gained. The apparently simple method of weeding out some of the works by attrition will not fulfil the purpose; besides being dangerous and of very doubtful efficiency, the process is not calculated to alter materially the position of the survivors, and what Belgian founders have to face is nothing other than a comprehensive overhaul of the very fabric of their works, plants, methods, and even, if not uppermost, their very frame of mind.

Mechanisation of Foundries.

By F. J. COOK, M.I.Mech.E., Consulting Engineer (Past-President of the Institute of British Foundrymen).

MECHANISATION is now the order of the day. It has been widely applied of late years in every domain where handling of commodities has to be undertaken and its success so pronounced that it is now accepted as being indispensable to practically any and every form of locomotion of goods in and around factories. Mechanisation in foundries has been applied for some time to blowing machines for cupola working, lifts to take materials on to the cupola stage, mechanically-operated sand mills and riddles, travelling cranes, etc., its advantages appreciated and its general application for such items assured.

The term mechanisation with reference to foundry work has, however, now taken on a more narrow or defined meaning, indicating the use of mechanism to ensure an automatic continuous moulding and pouring system, in which the moulding sand is conveyed to the moulding machines, the completed moulds mechanically conveyed to the pouring station, poured moulds passed to the knock-out position and knock-out sand, automatically treated, conditioned and deposited on to a conveyor, which conveys the finished sand to the moulding-machine hoppers.

Field for Mechanisation Defined.

Mechanisation in the above sense has been used most successfully for some years in American foundries for producing automobile castings, agricultural machinery, heating radiators and such work, and it has been similarly employed, to a less extent, on the continent of Europe, but only in very recent times have its possibilities in this country received the attention they deserve. Probably this is mainly due to the general opinion, that mechanised plants can only be economically employed where one type of casting has to be made in much larger quantities than is usually called for here. It is obvious that the necessity for very large outputs will warrant the expenditure incurred in installing plants complete in every detail, yet it is a fact that even where the requirements concerning output can be met by the installation of a few moulding machines, or even hand moulding or both, a more limited application of mechanisation can become a sound economic proposition. It will be found that if a careful time-study is made of the usual moulding operation in an ordinary foundry, the moulder very often does not spend more than a quarter to one-fifth of his time in the actual production of his moulds, the remainder being spent in general labouring, conveying the moulds to the floor, coring up, pouring, knocking out, etc., all of which can be done more expeditiously and economically by lower-rated labour with the judicious addition of mechanical appliances.

To ensure a successful, well-balanced, mechanised plant the designer should have a thorough knowledge of mechanical engineering on the one hand and a wide experience of foundry operations and management on the other. Unfortunately there are to be found glaring examples of schemes, devised either by engineers who are not familiar with foundry operations and management or by foundrymen who are unacquainted with the solution of engineering problems. In each case the result has been badly unbalanced plants and, in some instances, a great waste of money in capital outlay, without any relative resultant gain.

It is impossible in the space of a magazine article to give details that will fulfil the requirements of any scheme, in fact, each one requires special attention and becomes a time study of its own; but it is hoped that the following notes, regarding some of the salient points to be considered in connection with the various parts of a mechanised plant, will be found of interest to anyone contemplating the installation of such a system in his foundry.

MR. F. J. COOK
(Consulting Engineer and Past-President of the Institute of British Foundrymen).

Two Types of Mechanised Foundry.

Generally speaking, mechanised plants can be divided into two types, the one required to deal with operations where the supply of molten metal is intermittent, a good example of which is a cast-steel foundry, and the other where the supply of molten metal is continuous, as in grey-iron foundry work. The former is usually referred to as the batch method and the latter the continuous type of plant. In each of these the sand preparation and conveying of the finished sand to the moulding machines are very similar. In the continuous method, however, the moulds are taken to the pouring station and through a cooling chamber to the knock-out position by a continuously-moving mould conveyor, whilst in the batch method the moulds are generally carried from the moulding machines by short gravity roller tracks and then transferred and assembled ready for pouring on a similar type of track, at right-angles to the former. After pouring the moulds can be knocked out into a trough in the floor, the bottom of which is formed by a conveyor, preferably of the metal-apron type, which delivers the sand and castings on to a vibrating screen, where the castings are separated from the sand, the latter falling into the sand-preparing plant. Fig. 1 is an example of a small continuous type of plant installed in a purely jobbing foundry and designed to take moulds up to 10 cwts. each.

Mould Conveyors.

In reviewing the various parts of a mechanised plant, there will generally be found several alternative ways of performing the same operation, one of which, however, may be more specially suited for a particular problem than the others. The mould conveyors may be either the gravity-roller type with the moulds propelled along by hand power, of the pendulum type or of the mechanically-driven platform type; the last named, again, may be divided into the sprocket- or tappet-driven type. The tappet form is propelled by means of projections on an electrically-driven belt or chain, engaging similar projections attached to the underside of the mould carriers, thus ensuring a continuous travelling action. The movement can also be effected by tappets attached to the ram of a hydraulic or pneumatic cylinder. In this case the travelling is intermittent and is actuated by lever mechanism under the control of an attendant.

The motion of the sprocket type is obtained by links of a continuous chain, attached to the chassis of the mould-conveyor plates, engaging with the teeth of a sprocket driving wheel and with a similar wheel at the idler end. This type also ensures a continuous travelling motion and has often been applied to conveyors in which the conveyor plates skid along fixed rails. The latest and best type, however, is arranged for the mould carriers to skid on rollers, thus reducing friction and wear. The skids under the carriers are so arranged that they travel over the major width of the rollers, thus eliminating any possibility of the formation of narrow grooves due to wear.

The pendulum type conveyor, as its name implies, consists of rods or pendulums suspended from carriages which run on the bottom flange of overhead girders. Attached to the bottom of

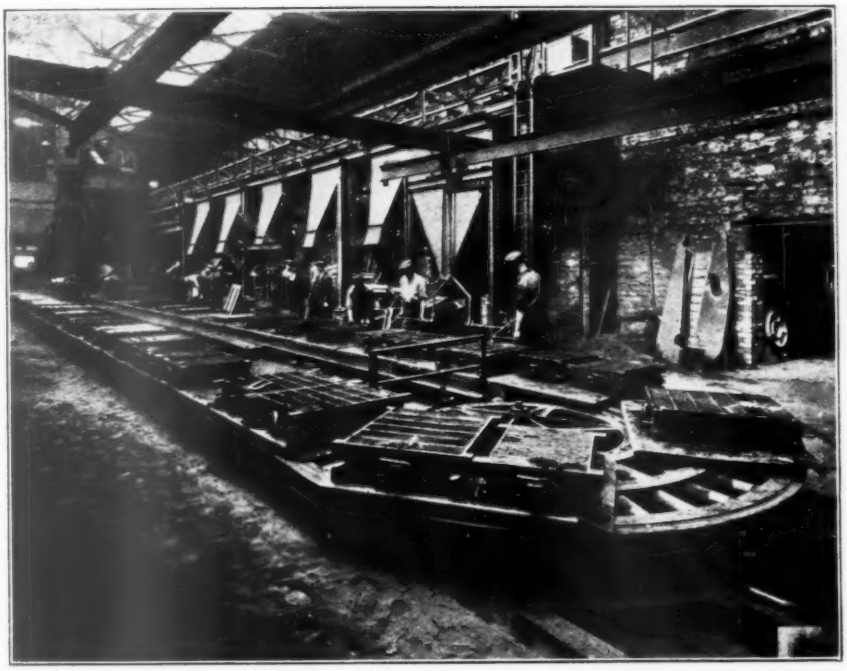

FIG. 1.—THE SMALL CONTINUOUS TYPE OF PLANT, FOR JOBBING CASTINGS UP TO 10 CWTS., INSTALLED AT THE CARDIFF FOUNDRY & ENGINEERING COMPANY, LIMITED.

the rods are the plates which carry the moulds. Fixed to the overhead travelling carriage is a chain, the links of which engage with the teeth of a driving sprocket and a continuous motion is thus obtained.

Tappet and Sprocket-Type Conveyors.

Naturally there are advantages which can be claimed for each of these types of conveyors, although many put forward are often merely talking points. It may, however, be stated that the gravity roller meets the requirements of the batch method of working and can also be employed where it is found necessary to limit the capital outlay to the lowest possible figure. But as the propulsion of the moulds has to be effected by hand power, this method, where continuous working can be employed, does not give such economical results as does the mechanically operated type of conveyors. Where it is considered desirable to place the moulding machines, and perhaps the sand preparing part of the plant, inside the mould-conveyor track (Fig. 2), the tappet form gives the best arrangement, as the bigger arc of a circle at the ends of the track ensures easier running.

The sprocket-driven type (Fig. 1) is best suited to an arrangement in which the moulding machines and sand-mixing plant are placed outside the conveyor track as the driving sprockets can be kept within a reasonable dimension of 5 ft. or 6 ft. diameter. The inside of the track can be used by workmen setting cores and clamping the boxes. The greatest overall width of both the sprocket and tappet-driven plants are generally very similar, but in designing a plant for an existing comparatively narrow building, where room has to be left for a subsequent duplicate plant, it is frequently found that the narrow sprocket-driven conveyor allows more room at the pouring end of the installation.

Pendulum Type Conveyor.

The pendulum type (Fig. 3) readily lends itself to irregular contours of track, either in the vertical or horizontal plane, and besides being used for mould conveying, is perhaps more generally employed for carrying the cores (Fig. 4) from the coremakers to the moulds, passing through the core-drying stoves on the way. In connection with each type of continuously-operated conveyor, it is essential that means be provided for readily altering the speed of travel. The "P.I.V." (positively infinitely variable) gear, which can be instantly adjusted to give any variation in speed within the limits the machine has been designed to meet, lends itself very effectively for this purpose and is to be preferred to the change-gear wheel type, which can only be operated in definite stages.

After the moulds have been poured, they arrive in due time at the knock-out station, having passed on their way through a cooling tunnel, if considered desirable.

The methods which may be employed for removing the moulds from the carriages are of varied types, requiring special arrangements to suit the conditions prevailing. These may range from ploughing the moulds from the conveyor, a method very effective and efficient for snap-flask moulds, through various methods of hand operation, to the pneumatic or hydraulically-operated push off, which is invariably employed for very large moulds. Fig. 5 illustrates the method adopted in the plant shown in Fig. 1 and this is usually employed for medium-size moulds within easy man-handling capacity. The speed at which moulds can be removed by two men is generally two per minute, as in the case illustrated, and varies from about six to eight per minute for small moulds, whilst the number which can be ploughed off is only limited by the speed at which the conveyor travels. It will be readily understood that no labour is required in the latter case, the ploughs being automatic.

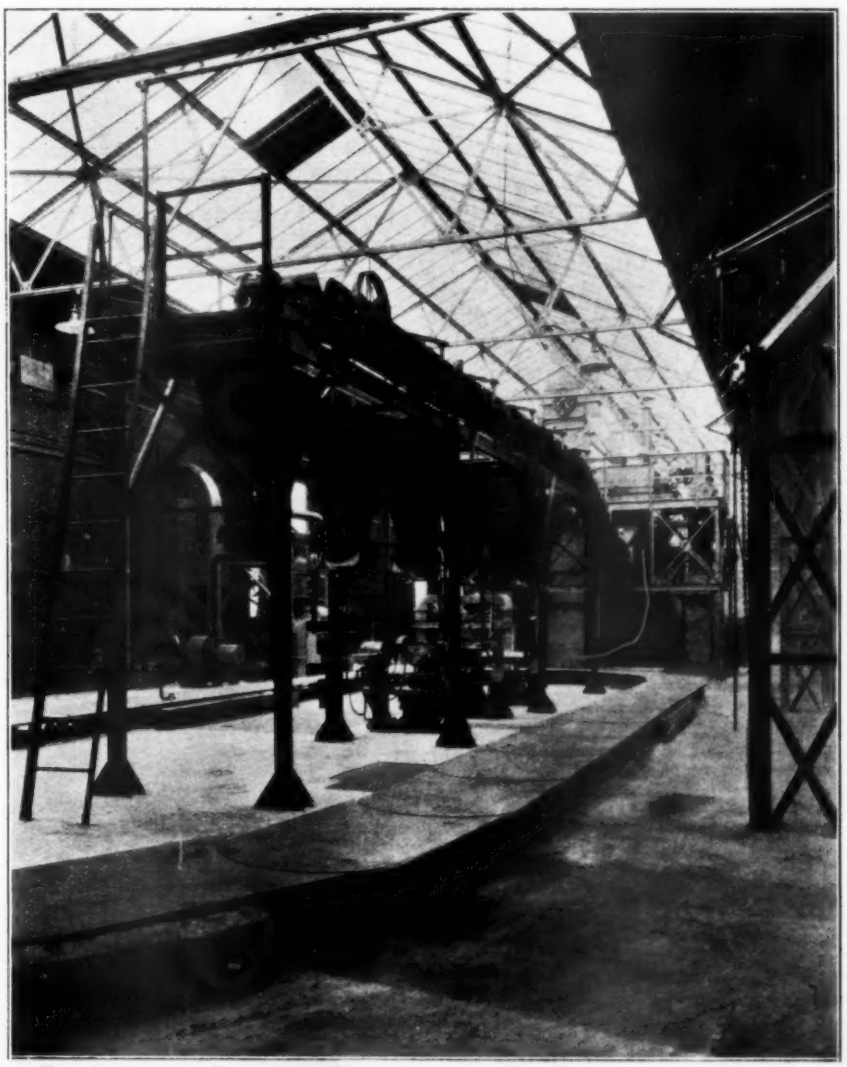

FIG. 2.—TYPE OF CONTINUOUS PLANT, WITH THE SAND-PREPARATION AND MOULDING MACHINES INSIDE THE CONVEYOR.

XUM

The empty moulding boxes are passed back to the moulding machines either by means of gravity-roller conveyors or by replacing them on the mould conveyor itself. The knock-out sand falls through grids in the floor into a hopper, from whence it is conveyed, after passing through the stages of receiving an addition of new sand, coal dust, magnetting and riddling and is then deposited into the main hopper in readiness for its final preparation.

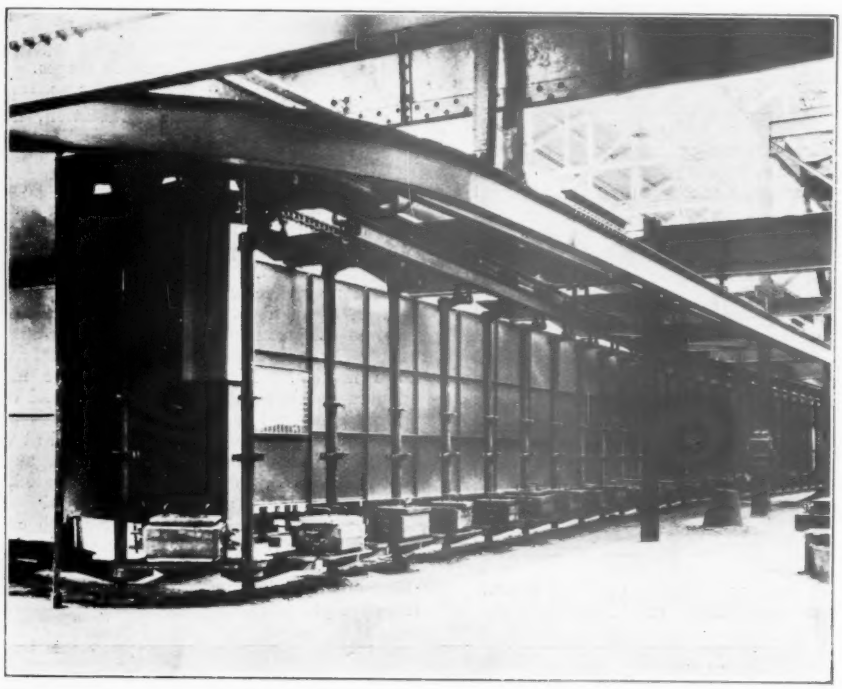

FIG. 3.—THIS LAY-OUT USES THE PENDULUM TYPE OF CONVEYOR.

Dust Extraction at the Knock-out.

There is one point in connection with knock-out sand which does not always receive the attention it deserves. In plants where separate facing sand is not used, passing the sand continually through the mullers causes it to be more or less heavily charged with dust, militating against that high degree of skin-finish on castings which is particularly desired for some classes of work. In such cases a dust extractor should be so arranged to draw the dust from the sand, as it falls into the knock-out hopper. While doing this it also removes the steam which arises and so performs a cooling action as well. The provision of such an addition is also desirable from the point of view that it protects the men, working in the vicinity of the knock-out, from the dust and steam which otherwise may arise.

In the sand-preparing portion of the plant, the sand mills are of special importance. There are several well-known mills in use in mechanised plants, such as the Baillot and Ronceray, of Continental design, the August-Muffle-Simpson type, whilst the new British type in which one of the rollers is replaced by a mechanically-operated stirrer is well worth consideration. Many of the Continental mills are very efficient from the mixing point of view, but some of them would be more efficient mullers, when dealing with most types of British sands, if the rollers were made somewhat heavier.

For the light type of castings, where much mulling of the sand is not necessary, the mills are run with a continuous discharge. Heavier class of work frequently calls for a tougher class of sand, necessitating a longer time in the mill. In such cases two mills are an advantage, one milling whilst the other is discharging, thus ensuring a steadier supply of finished sand. With this class of batch milling it is an advantage to insert a sand-measuring device in the supply-line to each mill, thus ensuring a given quantity of sand in each mix and a regular quality of finished product.

Elevators.

Another detail of the sand-preparing plant which requires more than passing notice is the elevators. These are generally of the bucket type with the buckets attached either to malleable iron or steel link-chains or to rubber-faced canvas belts. The buckets should be made of malleable iron, as these are less liable to rust, and therefore give a better discharge than buckets made from pressed sheet-steel. The sand feed to the elevators should be so arranged that the sand is delivered into the buckets and not into the boot of the elevator. Any spills from the descending buckets should be deflected and conducted back into the feed shute. The casing of the first elevator, taking the sand from the knock-out hopper, should be provided with a ventilator at the top, otherwise steam will accumulate at this point. The bottom tension drum or pulley in the canvas-belt type of elevator should be of the slatted type to prevent packing of sand between it and the belt. With the chain type the buckets should be attached to double chains, which prevent the buckets from becoming tilted to one side.

Sand Conveyors.

A rather contentious part of the plant is the conveyor which takes the finished sand to the moulding machine hoppers. This is usually either of a rubber-faced canvas-belt type or metal push-plate type of conveyor. There are strong advocates each contending that one or the other type gives the least liability to balling or of drying the sand, whilst passing to its destination. Speed is a determining factor in the successful working of both types. In the application of belts, special care should be taken to ensure plenty of supporting rollers to prevent the belt from sagging, and the liability of the rollers must be specially controlled to prevent flapping.

The belt type is somewhat cheaper in first cost, but not necessarily so in upkeep. Where backing sand only is dealt with, no serious objection can be taken to belt conveyors, but in cases where tough milled sand is used, the author prefers the push-plate type for the reason that tough sand ploughed off the side of a belt has frequently to reach the hopper through a somewhat circuitous route, giving a tendency for the sand to stick in the throat leading to the hopper. In the push-plate type this does not occur, as the sand merely drops vertically into the hopper through a hole in the bottom of the conveyor trough. Further, with ploughs, when a hopper is full, the sand will continue to be taken off the belt and deposited either on to the staging or on to the men or machines below, until such times as the plough is removed. This brings in the human element. In a similar case of the

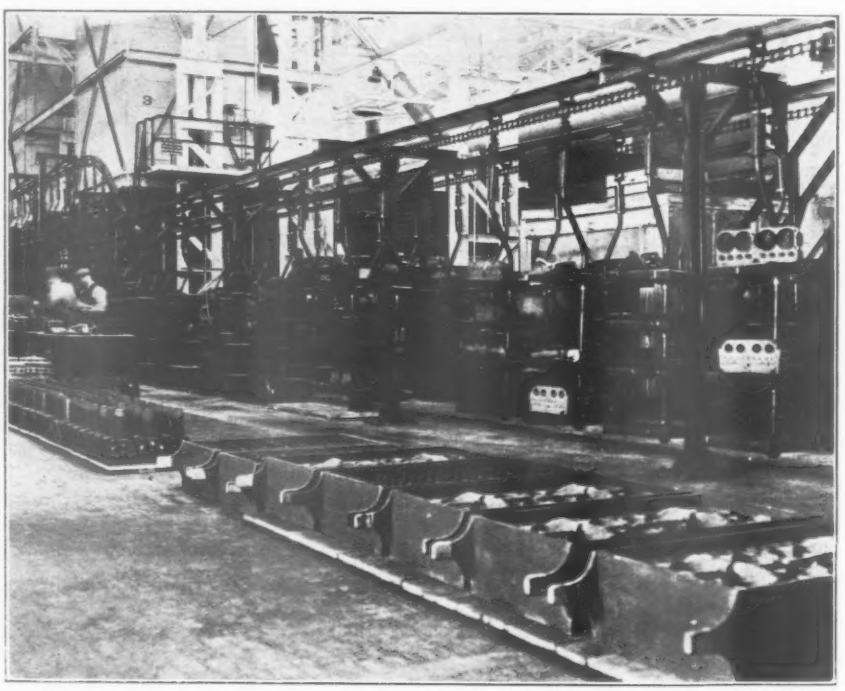

FIG. 4.—PENDULUM CONVEYORS ENGAGED ON

hopper being full, the push-plate conveyor merely carries the sand over, depositing it in the next hopper that can accommodate it. In large plants using the ploughing system it is sometimes found necessary to keep an attendant on the platform, adjoining the conveyor, to prevent the inconvenience of overploughing.

In both types of conveyor the surplus sand should be carried to the end of the system and passed through a shute to a storage bin, if there are facilities for using spare sand; or deposited on to a return belt conveyor, which carries it back to the sand-preparing plant, collecting on its way the spilt sand from around the moulding machines.

There are many items of detail which will more than repay the time spent in looking into them before a final decision is made to install a new plant. Amongst them are the facilities for easy inspection and ready replacement of various parts when found necessary, provision for ample and regular lubrication, the avoidance of all construction that affords receptacles for the collection of spilt sand, particularly in the vicinity of moving parts, and well-designed chain drives wherever these are installed.

In connection with the first of these items, particularly the elevators should be provided with large doors for ready inspection, access to the driving members and for the examination and replacement of belts and buckets. Ample room should also be provided around the tension end to allow of ready adjustment.

Ball and roller bearings are generally employed in engineering moving parts to reduce friction to a minimum, and generally are very effective in this direction when fully protected from contamination by dirt. The conditions as to dirt and dust that generally prevail in a foundry are such as to minimise greatly the value of this type of bearing in a mechanised foundry plant, and these should only be employed in special parts after very careful consideration.

Frequently the paths for runners to work upon are made of angle or channel sections, and whilst these sections form a very handy arrangement for this purpose, they have the very serious disadvantage of forming ready receptacles for the collection of spilt sand and dust, with the obvious danger of detrimental life of the bearings and general wear and tear. For such tracks it is much better to employ rails, supported at intervals, which allow spilt sand to fall past, instead of being collected.

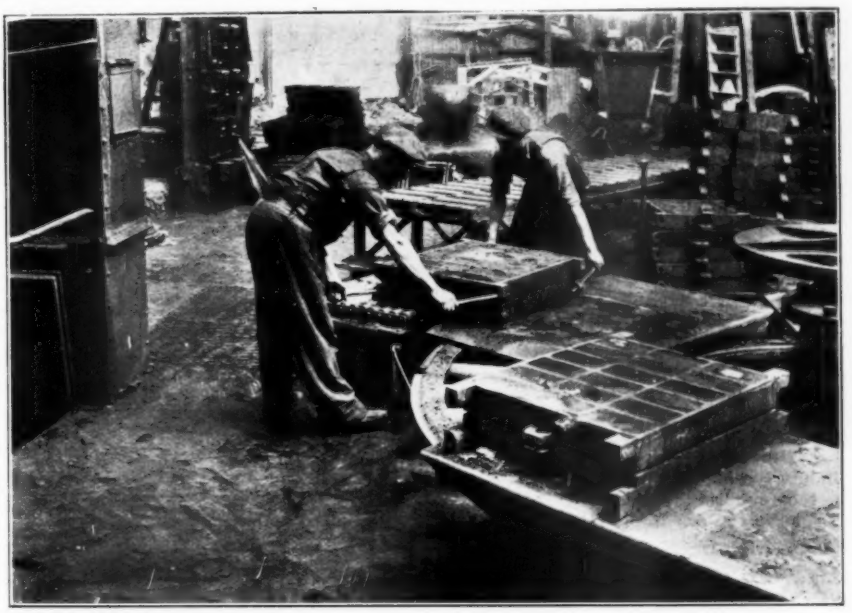

FIG. 5.—MOULD REMOVAL AT THE CARDIFF FOUNDRY COMPANY.

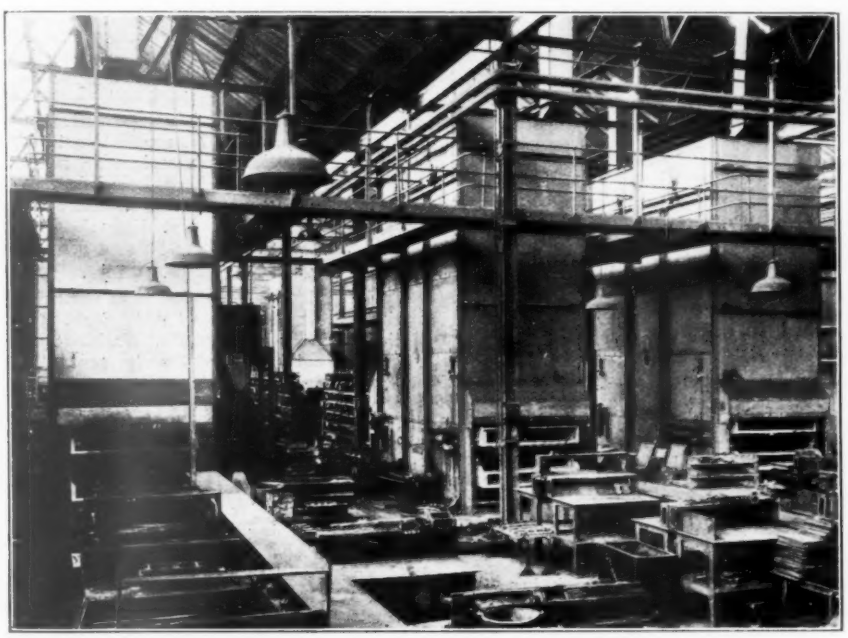

FIG. 6.—A BATTERY OF FIVE VERTICAL STOVES NOW REPLACING THE TUNNEL TYPE.

All running axles should have their bearings totally enclosed and as far as possible made dust-proof, provided with readily removable hardened sleeves and ample internal receptacles, which can be filled with oil or grease by means of a hand pump. Particular attention to this matter, both as to design and regular supply of lubrication will well repay for time and attention given to it.

For such parts as steel-apron conveyors, when employed in the knock-out hopper, and push-plate conveyors, which are usually driven by steel or malleable-iron chain, it is a distinct advantage for ease of running and alignment to fit them with two chains, one each side, instead of one in the centre, which is often done for cheapness.

Core Department.

Hitherto the lay-out and equipment of the core department has received very scant and haphazard attention, but the installation of mechanised plants in the moulding section has necessitated a very careful study in arranging for the making, stoving and transportation of cores, particularly in automobile and radiator foundries.

At first the horizontal or tunnel gas-fired type of core stove met with favour. The cores were passed through on pendulum conveyors during their progress from the coremakers to the moulders. They, however, are now fast being superseded by the vertical type, which possesses many advantages, not the least of which is a very great saving in floor space, economy in working and an entire absence of heat and fumes around the stoves. Fig. 6 illustrates a battery of five vertical stoves installed to replace the tunnel type, working in what is probably the largest automobile foundry in this country. Each stove having approximately 600 sq. ft. of trays deals with two tons of cores per hr. and occupies a floor space of only 18 ft. 6 in. long. The power to operate both the travelling action of the core carriers and the fan-supplying blast to the heating unit is only 1½ h.p. The furnace is worked by gas coke, the cost per unit of cores dried is not more than $\frac{1}{10}$th that required by the previous gas-fired stoves operating on exactly the same class of work. Furthermore, the time for drying has been reduced by two-thirds. Although the scrapping of so much practically new plant and the installation of the present system must have required very considerable courage, there is no doubt the results have fully justified the action.

The internal arrangement of this stove, which is of British design and manufacture, was first fully described and illustrated in the issue of THE FOUNDRY TRADE JOURNAL of June 4, 1931. The illustration here shown gives a good impression of how readily they fit in with a general scheme.

The lay-out of the core-making department will naturally vary with every different set of conditions. In the case illustrated the core benches are arranged at right-angles to a slowly-travelling conveyor belt by which the cores, as made, are carried to the core stove. This arrangement is meeting with general favour. The cores after drying are taken off the back of the stoves and

(*Concluded on page* 68.)

American Foundry Industry Seeks Way Out of Difficulties during 1932.

By C. E. HOYT (Executive Secretary of the American Foundrymen's Association).

DURING the past year American industry has dusted off its economic primers and has gone back to school in earnest. The foundries are no exception to this rule; in fact, industrial trends have made it more imperative for the castings producer than perhaps for any other type of manufacturer that costs be reduced, production systematised and co-ordinated with sales efforts, management modernised and every plant made more efficient in every smallest detail.

Accomplishment of these aims has come to mean, in the face of depression, the very life of the industry. It is well known, both in America and abroad, that in recent years there has appeared what some call a definite "trend" toward substitution of other metal products for castings. During the recent times of prosperity, when industry clamoured for more and ever more metals, the foundries received a very profitable share of business, despite the inroads of competitive processes, whose aggressive merchandising was much more modern and efficient than the average run of foundries.

Competition from Other Industries.

However, as buying in general slowed down, it soon became apparent to even the most heedless that a number of old-established castings markets had seemingly gone by the boards to other metal processes. Even the fact that, in a number of cases, this change over to competitive products has since proved less sensible than remarkable, has not changed the situation materially.

The American foundry industry has been forced to the realisation (and to serious contemplation thereof) that it must take drastic steps to regain lost ground and embark profitably on a new era of progress and advancement. It sees clearly now that it must thoroughly clean house—eliminate waste, reduce manufacturing costs, know all there is to know about their products and improve them constantly; that it must manage its affairs more efficiently—know its costs, control every phase of foundry production and lose no opportunity to establish and maintain thoroughly modern plants; and that it must adopt what for the average foundry is a new field of endeavour, aggressively convincing engineers as to the serviceability of castings, and merchandising those castings at a profit.

For some time the foundries have been decidedly hampered by failure to modernise along with other industrial groups. Progress has been held back by retention of outworn precedents; by lack of working capital; by inefficient equipment; by lack of co-ordination of sales and production, coupled with fullest development of castings marketability and by comparatively weak efforts at salesmanship.

To overcome these disadvantages is a programme which, it can truly be said to-day, was not clearly enough recognised until the current year, for the industry as a whole, to commence in earnest the necessary work of reconstruction. Although physical house cleaning began over two years ago, many months were wasted in fruitless hoping for quick return of prosperity before foundrymen began to dig beneath the mere surface of salary and wage adjustments. These superficial means of economy, simple to administer and simpler to gauge as to savings accomplished, were but drops in the bucket of depression. Next came the reduction of personnel, another item easy to lop off and equally inadequate. It has been only during the past year that foundrymen have really faced the facts and sought out the fundamentals of their plight. It is recognised that in times of driblet purchasing, plants geared for mass production suffer heavily and first; consequently, means of overcoming this handicap have been sought.

Efforts at Rationalisation.

Many manufacturing plants, which formerly operated their own foundries on a mass scale, have closed them down and are buying what castings they need from jobbers. Mergers and consolidations of several foundries have been

MR. C. E. HOYT
(Executive Secretary of the American Foundrymen's Association).

accomplished, in same cases taking the form of integration of processes. Thus, we find a jobbing foundry integrating with a permanent mould-casting manufacturer, so that either type of casting may be produced by the one organisation. In other cases we find foundries, recognising the widespread acceptance of welding, merging a welding unit with the production of castings and themselves employing this competitive process to their own profit and advantage where fabricated structures are desirable and feasible.

In correcting its difficulties the industry has made considerable progress in controlling all manner of wastes, such as materials wastes, heat losses, scrap castings, labour losses, due to poor supervision, and the like. The ultimate has by no means been achieved; the programme is barely begun. However, the results it has accomplished are sufficiently promising to have shown the way to lower costs and that more certain uniformity of product on which foundry success must depend.

Plant Lay-outs Improved.

One industrial trend which has made the foundry's task of reconstruction more difficult is the trend toward more definite specifications by buyers. Specifications require—in fact, demand—more uniform control of all processes. They definitely doom the continuation of rule-of-thumb methods by the shop foreman. They mark the knell also of inefficient, antiquated equipment such as has played a damaging part in increasing production costs and destroying the chance of securing competitive business at a profit. This necessity for control has turned many a foundryman's critical eye upon his entire plant lay-out. Many foundries have had an extremely haphazard growth, units being added only as needed and with little regard for the continuity of production. Inefficiency and waste has resulted until now attention is being focused more and more on modern methods of materials handling, involving the employment of unused floor and ceiling space, straight-line routing, etc.

The Text-Book Curse.

In efforts to drive home to the engineers who buy and specify metal parts the usefulness of castings, the foundry industry of America has embarked on a vigorous programme of education. It has long been realised that existing handbooks and text-books, prepared years ago but still used widely by engineers for want of more up-to-date data, place cast metals at a disadvantage in the eyes of buyers. To correct this situation the foundry industry has held a series of co-operative meetings with the engineers themselves. The first such meeting, a symposium on malleable-iron castings, was sponsored in 1931 jointly by the American Foundrymen's Association and the American Society for Testing Materials. A second joint symposium between these two societies was held last June on steel castings. Grey-iron castings will be the subject of the third of these joint symposiums, to be held during the A.S.T.M. convention in Chicago next June. A joint symposium on methods of testing castings has been scheduled for the American Foundrymen's Association convention in Chicago the week preceding the A.S.T.M. meeting.

And a Laudable Effort.

Early in 1932 a series of joint meetings with engineers was held in Pittsburgh, Chicago, Philadelphia and in Seattle, Washington, sponsored by local groups of foundrymen. All these meetings had for their primary purpose the informing of engineers as to the utility of modern castings in the engineering field. A further step in this programme of education involved the preparation of a cast-metals handbook, the first such text authorised and sponsored by the foundry industry as a whole. This text now is being prepared by the American Foundrymen's Association for publication in 1933, and it will be widely distributed among all who are interested in the purchase of metal products.

Design of Castings.

One phase of this determined move to drive out old-fashioned and erroneous conceptions of the engineering application of cast metals has taken the form of stressing better castings design. Admittedly, the makers of competitive materials have been more versatile than castings producers in redesigning products for manufacture by their own processes. Also, it is common knowledge that the foundry has been handicapped by the necessity of producing parts arbitrarily designed with little regard for

foundry practice, whereas the same parts, when specified in other metals, give every consideration to all limitations of the metal process involved.

Realising this, foundrymen are giving greater attention to improving design, a trend which to-day permeates all American industry. In doing so, the foundry is making every effort to get accurate information before the engineering profession so that their hands will not be tied by being required to produce intricate, poorly-designed castings which could be better designed for more economical foundry production. This, of course, in the end concerns the matter of price, sharp price cutting being at present highly aggravated, as it always is in a period of business lethargy. The past year has been no exception, with ever-lower prices being quoted for raw materials as those of finished goods have continued downward in efforts to attract listless buyers. In the foundry field the price situation has been so appallingly unstable (and in cases even ridiculous) as actually to have done the industry some good.

Price Cutting and Costing.

For one thing, it has called glaring attention to the fact that there still are many foundrymen who simply have no knowledge of their costs. For years they have been selling on a "by guess and by gosh" policy of bids, the idea being, as one remarkable individual (now out of business) expressed it to his sales force: "We want tonnage, and lots of it. You get it; we'll do the rest."

The industry knows now that tonnage is one thing, and that tonnage at a profitable price is far different. Thus, attention has been forcibly directed to cost methods as a basis for quotations intelligently arrived at and courageously enforced. To be sure, it is more than can be expected that the price situation can be corrected before business conditions improve considerably, but, when they do, it should certainly be administered on a more scientific basis of cost finding and cost keeping than many foundrymen have been guilty of in the past.

This question of price also has been connected directly to American governmental affairs. As profit margins have dwindled, taxes have mounted until now it is extremely doubtful that there is any country in Europe which has not heard American industry shouting, over and over again, "Reduce governmental costs and cut taxes!" Some notable reductions have been made under pressure, but much more remains to be done. As 1932 closes, we in America's foundry industry are looking to industrial co-operation as one activity which will be of vast assistance in our pull out of the sloughs of despond and depression. We look for no miracle to settle our problems and those of our neighbours across the seas; the best we can hope for is that our mutual difficulties will speedily be adjusted with a minimum of passionate exhortation and a maximum of common sense and good will.

We anticipate no arrival of renewed prosperity, of jobs for all, by any magical political formula or economic fiat. Rather, we are convinced now more than ever before that the solution of our domestic difficulties lies in hard work, hard thinking and the determination to get together, pull together, and hold together as an industry whose problems are far from dissociated with those of all industry and occupations. To-day, resignation to the current bad situation has nevertheless brought with it the power to think ahead once more, to look ahead and plan ahead. American industry, as 1932 closes, has its jaws set. It makes no excuses now—the supply was long ago exhausted. It asks no pardon now—the responsibility is too world-wide. Nor does it cling to will-o'-the-wisp promises, such as it followed fruitlessly for nearly three long, hard years. It simply says, to-day, that what was done once is past, and the lesson learned, that hard work, and hard work alone, will bring us out of this.

And America's foundries are of the same industrial opinion.

The French Foundry Industry in 1932.

By E. V. RONCERAY (President of the French Foundry Technical Association).

THE year 1932 has been one of the darkest in the history of French industry. Business was duller than ever; the Government budget showed a considerable deficit; unemployment, which was unknown in preceding years, assumed considerable importance. Nevertheless, the Association Technique de Fonderie, which had agreed to organise the 4th International Foundry Congress, did not wish to deceive the foundry world and accomplished its duty to the best of its abilities. An international exhibition held at the same time was organised by the Syndicat Général des Fondeurs de France, the Association Technique de Fonderie, and the Association Amicale et Mutuelle de Fonderie.

The Congress and the Exhibition have been the main features of the French foundry industry for 1932. In spite of the difficulties of the time, both events were considered to be a success by the 600 participants who came from 13 different countries, as well as by the numerous visitors to the Exhibition.

If the main features of these events are examined it will give a fairly true picture of the whole foundry industry. About 500 exhibitors, *i.e.*, about the same number as in 1927, were showing; but, as was to be expected, the displays were of a less expensive character, though of intense interest. The continuous foundry, including melting and pouring, which was shown in 1927 in actual operation by the firm of Messrs. Bonvillain & Ronceray, was not reproduced, though other very interesting and new devices were shown by a number of exhibitors. The principal features were the high-speed moulding machines of various kinds, great improvements in sand-mixing methods, improvements in sand and mould conveyors, and, above all, the generalisation of scientific control and management. This was quite apparent in the exhibits. One was impressed by the number of sand-testing machines, the scientific aspect of the advertisements of sand merchants and pig-iron makers, the large number of pyrometers, metallographic apparatus, dilatometers, and all kinds of scientific devices used in everyday practice in foundries. This development is considered to be due to the ceaseless and combined actions of the Association Technique de Fonderie and of the Ecole Supérieure de Fonderie. The latter is now entering on its tenth year of existence.

MR. E. V. RONCERAY
(President of the Association Technique de Fonderie).

There was a joint exhibit by these two bodies (Fig. 1), the overall dimensions of which were 42 ft. by 30 ft. The Association Technique de Fonderie exhibited its Bulletin in the form of bound yearly books as from 1927, charts showing growth of membership, now 1,100, the work of its technical committees, results of competitions organised during the Congress, etc. The Foundry High School showed a complete set of its printed courses, samples of the work of its students, and a complete laboratory in actual work which created a considerable amount of interest amongst the visitors.

The main features of this laboratory were, in addition to the ordinary set of sand-testing devices, a Chevenard dilatometer fitted with variable-temperature regulator, and a complete outfit for the chemical analysis of cast iron, including some apparati recently devised and perfected at the School for the rapid determination of sulphur and total carbon. The laboratory was actually making analyses for exhibitors. Inside the exhibiting space a room was arranged, on the walls of which were affixed charts, drawings, etc., referring to the instruction given. Several lectures were delivered in this room during the Exhibition by:—Mr. Albert Portevin, on "Segregation and Liquation"; Mr. Lemoine, on "Cupola Steel Melting"; Mr. Fournel, on the "Teaching Analytic Chemistry at the Foundry High School"; Mr. Pillon, on the "Calculation of Lifting Efforts on Moulds and Cores," and Mr. Debar, on the "Teaching of Foundry Practice at the Foundry High School."

Mr. Pillon's very interesting lecture was a part of his Exchange Paper to the Institute of British Foundrymen, which seems not to have been quite understood by the foundrymen present at the Newcastle conference. Amongst other things, it gave to the practical man a graphic method of how to determine the lifting efforts on moulds and cores due to the metal when filling moulds, and showing that the Pascal principle is to be used to the exclusion of Archimedes, as the latter often causes endless mistakes and complications.

This combined exhibition, coupled with the inspection of the other exhibits, gave one the impression that scientific and systematic control and methods are being used more and more every day. Not only for the metallurgical side of the industry, but also, and perhaps to an extent not attained often in other countries, referring to the systematical study of the so-called pro-

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fessional side which, so far, has been left rather to the empirical mind of the foremen. This is certainly due to the fact that, since 1924, some two hundred young men trained at the Foundry High School in both metallurgical and practical knowledge have been spread over French foundries and are beginning now to make their influence felt. It is to be regretted that, up till now, no Britisher has taken the courses of this School, which is unique of its kind, in the world. It is pleasing to learn, however, that one British student is planning to come next year. Many other countries have sent students, including Belgium, Switzerland, Italy, Spain, Norway, Poland, Czecho-Slavakia, China and Japan.

The Congress, in spite of the hard times prevailing, was quite a success. It was opened at the Sorbonne by the Under-Secretary of State for Technical Education; no less than eleven sessions were held, 43 Papers, all printed in advance, were discussed, sessions were held in common with the Comité National de l'Organisation Française, the Société des Ingénieurs Civils de France, and the Comité des Forges de France, which is the National Federation of Iron and Steel Manufacturers of France. Visits were made to several foundries around Paris, including those of such big firms as Renault & Citroën. The social side was not forgotten. Every day there was a luncheon. Evening re-

Fig. 1.—The Stand of the Paris Foundry High School.

ceptions were held at the Hotel of the Société des Anciens Elèves des Ecoles Nationales d'Arts et Métiers, and also on the first platform of the Eiffel Tower. Yet another banquet, presided over by the Under-Secretary of Technical Education, Mr. Hypolyte Ducos, was held at the Palais d'Orsay on the closing day of the Congress. The following day the visitors were received at the Château of Rambouillet by Mr. Albert Lebrun, President of the French Republic. A trip into the Ardennes district was commenced the following day. During this trip receptions and banquets took place at Charleville, Saulnes, Esch, Luxembourg and Nancy. At these places many more delegates appeared than were registered.

British Delegation.

The British delegation consisted of 29 members. Italian and Spanish delegations were more numerous, but we had the pleasure of meeting in the British delegation very representative members of foundry industry and science, including Mr. Harley, President of the International Committee of Foundry Technical Association; Messrs. F. J. Cook, J. Cameron and V. C. Faulkner, Past-Presidents of the Institute of British Foundrymen; Sir Henry Fowler, President of the Institute of Metals; Mr. J. G. Pearce, Director of the B.C.I.R.A., also representing the Iron and Steel Institute; Mr. J. E. Fletcher, consulting engineer, and Mr. T. Makemson, Secretary of the Institute of British Foundrymen.

Most of the Papers were of a very high standard. Some of them referred to the practical side of the trade. By comparing the transactions with those of the first French Congress held in 1913, one is able to realise the enormous change in the minds of French foundrymen. The transactions of the 1932 World Congress are bound in book form, and with them are the advance programme and report. The whole makes a nicely illustrated book of 600 pages, which most of the visitors will keep as a souvenir. Fig. 2 shows the President of the Republic surrounded by his guests, including the writer.

Industrial Conditions.

The present crisis has brought about a very sharp competition, low prices and losses to a great many foundries. Apart from the general improvements due to the more scientific and keen spirit encountered in the foundries, the main developments are as follows:—The high-test cast irons are produced in many foundries through using the knowledge spread by the Association Technique de Fonderie and the Foundry High School. No special secret is claimed by them, nor do they seek to patent it. Given a problem of some kind to solve or certain conditions to meet, one can always find in their transactions or through their studies the necessary information and the men capable of applying it.

Frémont Tests to be Standard.

The Frémont tests recommended by the Association Technique de Fonderie have now been successfully used by the Navy for several years. They have also been adopted by the War Department, the railways, and very likely will shortly become standard in France.

The melting in cupolas is now done by putting to better use the simpler devices rather than by the complicated systems. The Foundry High School theory is that a simple cupola when properly handled gives as good, if not better, results than those systems advocated in commerce as providing good melting. It has been proved many times that the improvements are due rather to the better handling of the melting by the operators of patented apparatus than to the virtue of the complicated devices. A good many of these so-called improved cupolas are converted into ordinary types without modifying the results when properly handled.

The rotary furnace has made some headway, though it is not universally recognised as such an important improvement as has been claimed for it. It is considered by many that a cupola with a heated receiver is more economical, more flexible and quite as efficient a melting device for most cases. Continuous pouring is made possible, whereas it is almost impossible by the use of the otherwise costly rotary furnace.

The electric furnaces of all makes are developing very rapidly. They are used to a great extent for steel melting and are displacing the converter for the best qualities of steel. For high-test iron, they are used more and more every day, especially in the blast-furnace districts where electric power can be had at a low price. Finally, the brass and light-alloys foundries are also beginning to use some kind or other of electric furnaces. All electric furnaces are gaining ground, and not only the various systems of arc furnaces, but also the resistance and low- and high-frequency induction furnaces. This last-mentioned is used extensively for the manufacture of expensive special steels and for laboratory work.

The air furnaces for malleable castings were making headway some few years ago. Their advance is now checked either by the rotary furnace or in a good many cases by the cupola supplemented by a heated receiver or by an electric furnace. At least two of the most important black-heart malleable foundries have discontinued the use of air furnaces and are now working with cupolas and oil-heated receivers. None is yet working in combination with mould conveyors, but it may be that the latter will become a further development, the melting plant being made to give metal continuously.

There have not been many great changes in the moulding processes, but the control and preparation of sands have made progress. The methods of control have been more or less copied from U.S.A. However, some changes have been made in this country. Recently continuous working machines have been devised and installed producing large quantities of sand perfectly prepared, permitting the use of a unique sand of good quality in continuous foundries. The moulding machines are bordering on perfection. The question now is not so much to find good and speedy machines, but to equip, feed and use them properly. It very often happens that a good machine is giving a considerably reduced output through improper use.

The centrifugal process is gaining ground. Several pipe foundries are equipping themselves very extensively and using different processes. The delegates visited works in the Ardennes district where such an installation is being laid down. Otherwise pipes are moulded and cast on revolving tables. Cast and ground piston rings

Fig. 2.—The President of the French Republic amongst some of the principal Delegates to the International Congress.

are being used more and more every day by the largest automobile makers.

The making of castings by using block cores has gained ground. The advantage is that deliveries can be made quicker than by direct moulding which is often of importance. For instance, for the prompt delivery of locomotive cylinders in the case of an urgent order, unskilled labour can be used for cores instead of skilled men, which is of importance in a country where 1,800,000 men have been killed or severely wounded during the last war.

A cement-sand process, described in one Paper of the Congress, has been somewhat confused with the block core process. From the comments of the foreign Press, it seems that the cement-sand process is unknown to many foundrymen. Both Moldenke's test book and those of the Foundry High School mentioned sand-cement cores a long time ago; a proprietary core-binder for air-drying of cores is used to a certain extent for the same or similar purposes. Several core-blowing machines of various designs were exhibited. Core making is very far behind mould making. The problem of making cores quickly by machines is rather difficult to solve.

The process of cleaning castings is making as much headway as are other branches of the trade. Sand-blast plants are being used to a great extent, and the cleaning arrangements to prevent dust from inconveniencing the workmen are practically perfect. A few high-pressure water-cleaning plants have been installed. They

are not developing very quickly, as it has been found that the overhead charges are rather high, while the time saved is not as much as was expected. For the cleaning of heavy castings by a jet of water cannot be started before they are reasonably cold. Rapid delivery of castings, therefore, is not much speeded up by the use of the process. The tumbling barrel in France is not very popular, as it knocks the castings about, rounding the edges. Sand blast and direct cleaning are preferred.

Malleable Castings.

Black-heart malleable is becoming very popular. Sometimes it is unfortunately specified for purposes where it is harmful, *i.e.*, where brazing or welding is required. Further developments of black-heart malleable can be expected though the improvements made in cast iron, and cast steel will keep it from making much ground. The melting processes used have been touched on above. The annealing is now being done in improved furnaces. The old Ardennes annealing furnaces are being replaced by better designs of furnaces heated by pulverised coal with pyrometer control. Some of the most important firms have tunnel furnaces. Unfortunately, there are too many small firms for which improvements and scientific control remain difficult if not impossible. It is to be hoped that, under the pressure of actual circumstances, some of them will amalgamate with a view to reducing overhead charges and to improve manufacturing conditions.

The non-ferrous foundry is developing some high resisting alloys containing aluminium, manganese, silicon, etc. The common products of light and medium weight are being made in green sand more and more every day, whereas they were generally made in dry sand a few years ago, with the result that the use of mechanical moulding and continuous foundries is made possible in more cases now. In fact, a few brass foundries having conveyor installations have been started recently. A great effort is being made to produce brass castings in permanent moulds.

The light-alloys foundries are developing along lines using both sand and permanent moulds. Apart from the standard alloys, Alpax and Electron are being used more and more every day. Other silicon alloys are also employed, while magnesium alloys are gaining ground. The inspection for aircraft castings is extremely severe, and great skill is necessary to comply with the very exacting requirements of the authorities, which, of course, are justified to protect the life of the airman.

The physiognomy of the foundry industry is changing very rapidly. First of all, it has to meet the competition of allied industries—stampings, welding of assembled structures, even reinforced concrete (lamp posts) and plastics. These are making competition with the foundry industry every day. The various classes of the foundry trade are taking business from each other, *i.e.*, steel takes trade from malleable, malleable from cast iron, cast iron from non-ferrous and others, light-alloys from steel, malleable, etc. Much fear has been expressed several times that the foundry industry is going to disappear or that it will see its field of action reduced. In the opinion of the writer, this fear is not justified. Foundry improvements enable foundrymen from time to time to take work from the structures shop. Truck and locomotive frames are now being made of steel castings, doing away with assembling. The foundry industry is in constant evolution. It is its duty to satisfy the every day more exacting requirements of our industries. So far few problems have been proposed that the foundrymen have not been able to solve. The high temperatures required in high-pressure steam or in oil combustion engines, the corrosion problems, the lightness required by aviation, etc., have all found admirable and complete solutions. Every day the foundry, by the use of pressure-casting machines, is producing finished castings drilled, taped and engraved as well. Sometimes these parts are better made than by machining. The only thing which can happen is the evolution of the foundry industries, which will have more and more to become scientifically and technically managed.

Amalgamations will have also to be made. The small firm, with too small a volume of business to have scientific control, will have to amalgamate not only to cut down overhead charges, but also to obtain the financial and technical means to produce first-class products at a reasonable price. More than 20 large foundries have now joined under the name of the Société Générale de Fonderie, with the result that complete products are made in the various works of the company, from the pig-iron to stoves, pipes, radiators, etc. Other firms of less magnitude have done or prepare to do the same. Even small brass foundries have amalgamated for the same purpose.

Research Activities.

The research work has been so far carried out in private enterprises. The Société des Hauts Fourneaux de Saulnes has recently started a research laboratory. Some private firms have also well-equipped laboratories where splendid results have been obtained. One of several undertakings will eventually be opened in the near future, and there is much left to be done in this respect. It seems that little trouble will be met with to supply them with good men as the Foundry High School renders them readily available. Courses for foremen are also given two nights a week at the School, where future foremen can improve their knowledge.

The Work of the Institute of British Foundrymen in 1932.

By VICTOR STOBIE, M.I.E.E. (President, 1932).

ONE would not be surprised if a year of financial stress, such as the one which has just ended, resulted in reduced membership and retarded activities on the part of technical societies. It is, therefore, a matter for unusual congratulation that the membership of the Institute of British Foundrymen has been so excellently maintained during the past year, and that the year has, probably, been one of the most active of any in its history.

For many years the work of the Institute has centred around the reading, discussing and publishing of Papers presented before the branches and the annual conference, interspersed with visits to works and with social gatherings which have done so much to cement the good feeling which exists among those engaged in the industry, and to bring down the barrier of conservatism. These activities have been continued during the past year, and considerable progress has also been made in the important new works launched by the Institute during the last two or three years.

One of the most important developments of recent years, which has received considerable impetus during 1932, is the codifying of all ascertained knowledge in the science and art of founding, and the interpreting of the results in a manner enabling them to be applied to everyday work. Another highly successful venture is the inaugurating of a comprehensive scheme for the training of the founders of the future; and here, in honour of our followers, might be allowed that appellation to carry a quantum of its more colloquial meaning?

The Work of the Technical Committee.

The Institute carries out the first of these objects through its Technical Committee, which was formed in the latter part of 1930. Two new sub-committees have been formed during the year, dealing respectively with melting furnaces and costing. Together with the existing sub-committees on cast iron, malleable cast iron, steel castings, non-ferrous castings, and sands and refractories, the sub-committees cover practically every branch of foundry technology. They commenced their work by a careful review of a large number of specifications for castings issued by public bodies, and also by private purchasers, and were able to point out to several issuers how their own requirements would be met equally well by the adoption of standard specifications. On the whole, these suggestions were welcomed, and the sub-committees feel that they have, already, contributed to some extent towards reducing the multiplicity of specifications which are issued.

The Sub-Committees then proceeded to carry out their investigation programmes. Work in hand at present includes a comparison of standard methods of testing moulding sand; a tabulation of physical data for cast iron and for non-ferrous metals; establishment of practical data on the contraction of castings; experiments on size and shape of test-bars for grey iron, malleable cast iron and non-ferrous castings.

Malleable Acceptance Tests.

At the last Conference of the Institute, held in Newcastle, the Sub-Committee on Malleable Cast Iron presented a Report which gave excellent evidence that, during the short time it had yet existed, it had made considerable progress in its studies of the many technical problems relating to malleable cast iron. This Report gave important reasons why a microscopic examination should be included as a standard test for certain classes of malleable castings, and a working scheme for such a test was incorporated. This Committee is continuing actively the work which was outlined in the stimulating report; and it is probable that at the next Conference, which will be held at Cardiff in June, 1933, further reports will be presented from one or more of the Sub-Committees.

Quite recently the Technical Committee has established an Information Bureau for the benefit of members of the Institute, and inquiries of various kinds will be considered and answered by the Committee. When advisable, the replies will be published in THE FOUNDRY TRADE JOURNAL, by permission of the proprietors and the Editor. The Committee has also undertaken to organise of Technical Section at the International Foundry Exhibition to be held in London at the end of April and early in May, 1933. This exhibit will be illustrative of the work and investigations of the Sub-Committees, and will indicate recent progress in foundry technology.

Monthly Index.

The Index to current foundry literature, which was first issued in the latter part of 1930, has been issued periodically throughout the year, and

many members have expressed their appreciation of its value. The issue of this Index is made possible by the work of the joint editors, Mr. V. C. Faulkner, a Past-President of the Institute, and Mr. V. Delport.

These technical activities of the Institute are not competitive with the work of the Research Associations or of consultants, but are intended to interpret modern research work in such a way that it can be applied to immediate use. The British Cast Iron Research Association, the British Non-ferrous Metals Research Association and several well-known consultants, are represented on the Committee and its Sub-Committees, and the Institute is indebted to them for their active co-operation and assistance.

Technological Certificates.

The Institute's efforts to promote the training of the Industries future personnel have been directed to the promotion of examinations of a national character in order to provide a goal for the foundry student and to encouraging the establishment of courses throughout the country for the preparation of students for these examinations. The National Certificate in Mechanical Engineering, issued jointly by the Institution of Mechanical Engineers and the Board of Education, is now endorsed by the President of this Institute in respect of special foundry or metallurgical subjects which have been included in the courses leading to the certificates. Although this scheme has only been in operation for less than two years, some twelve of such certificates have already been so endorsed. The certificates are awarded after a four years' approved course of a fairly advanced character, and the certificate constitutes a diploma in foundry engineering of a high order. The sound engineering training which the students receive during this course, together with their practical experience, will eventually result in the provision of men well qualified to occupy the positions of responsibility in the foundry industry of the future.

Craft Certificates.

An essential need in the industry was the encouragement of the technical training of the apprentices who will constitute the future workmen and foremen in the foundry and pattern-making shop, and an endeavour has been made to meet this requirement by the establishment of the City and Guilds of London Institute examinations in foundry practice and in patternmaking. The syllabuses for these examinations have been prepared by an Advisory Committee formed by the Institute, upon which a number of other technical and educational organisations are represented. This Advisory Committee also assists in connection with the actual examinations and endeavours to promote the formation of suitable courses of tuition in various centres. The scheme is, therefore, in direct contact with the industry through the Institute and with the organised bodies representing education authorities, principals and teachers in technical institutions.

The first examinations under this scheme were held in April, 1932. In the examination in foundry practice there was a total of fifty candidates, including twenty-seven candidates who had followed registered courses at ten different colleges, and twenty-three other candidates who had qualified either by private study or by attending non-registered courses. The latter included fifteen candidates from the Sheffield Foundry Trades Technical Society. Thirty-one of these candidates passed the examination: ten in the First Class and twenty-one in the Second Class. The Bronze Medal, which is awarded for the highest place in the whole country, was awarded to Mr. T. R. Walker, who is hon. secretary of the Sheffield Branch of this Institute and a student of the Sheffield Foundry Trades Technical Society.

In the subject of patternmaking, there were fifteen candidates in the Intermediate Grade, of whom three were awarded first-class certificates and four passed in the second class. There were eight candidates in the Final Grade, one of whom passed first class and two second class. The Silver Medal awarded in the first grade for the highest place was gained by a student of the Rugby College of Technology and Arts, Mr. G. K. Simpson, and the Bronze Medal for the highest place in the Intermediate examination was awarded to a student from the Sheffield Foundry Trades Technical Society, Mr. J. G. Rees.

These results are exceedingly encouraging in the first year of the examinations. It is even more encouraging to be able to report that three-year courses in the subjects of either pattern-making or foundry practice, and in drawing and calculations, are in operation at about thirty technical colleges and schools; and it is expected, therefore, that a considerably increased number of candidates will present themselves for future examinations. The standard of the courses is such that the student is provided with technical training of a character which will make him an intelligent workman or foreman, and the standard is also sufficiently broad to form the basis of more advanced work for those students who are capable of carrying out such work, and who are ambitious to fill the more responsible positions in the industry. These educational schemes fostered by the Institute will result in the foundry trade possessing a body of men who are technically trained and sufficiently adaptable to handle the constant developments and changes which are rapidly ameliorating the industry.

Important Contributions to Technology.

The Annual Conference of the Institute was held in June at Newcastle-upon-Tyne and, in spite of the long distances which many members had to travel and also of the uncertain trade conditions, the attendance was most encouraging. Several of the Papers offered for discussion opened up new ideas in foundry technique, examples being: an important review from Dr. Rosenhein, F.R.S.; the report of the Sub-Committee on Malleable Iron, already referred to; an illuminating study of camber and distortion in castings by Mr. E. Longden; and a Paper by Mr. J. E. Hurst on very important developments in the heat-treatment of cast iron. Mr. Hurst's pioneer work on this subject and in other branches of cast-iron metallurgy were recognised at that Conference by the award to him of the Oliver Stubbs Medal, which is the highest award the Institute can bestow.

Any comments on this Conference would be incomplete without an expression of the gratitude of the Institute to the Lord Mayor, Deputy-Lord Mayor, Sheriff and Corporation of Newcastle for their interest and their hospitality; also to the various firms in the area who co-operated in the entertainment of the visitors and arranged for parties of members to inspect their works; and to the Local Reception Committee and, especially its hon. secretary, Mr. J. W. Eckford.

In September last an International Conference of Foundry Technical Societies was held in Paris, and was attended by some thirty-five members of this Institute and their ladies. The Conference was of more than usual interest to British founders as Mr. Andrew Harley, the immediate Past-President of this Institute, was President of the International Committee of Foundry Technical Associations during the year 1932 and, in that capacity, was the principal guest at many of the functions of the Conference.

THE INSTITUTE OF BRITISH FOUNDRYMEN.

OFFICERS, 1932–33.

PRESIDENT:
Victor Stobie, M.I.E.E.

VICE-PRESIDENTS:
C. E. Williams; R. W. Stubbs.

PAST-PRESIDENTS:
R. Buchanan. (Deceased.) 1904–1905.
H. Pilkington. (Deceased.) 1906–1907.
F. J. Cook, M.I.Mech.E. 1908–1909.
P. Longmuir, M.B.E., D.Met. 1910–1911.
C. Jones. (Deceased.) 1912.
S. A. Gimson. 1913–1914.
W. Mayer. (Deceased.) 1915.
J. Ellis. (Deceased.) 1916–1917.
T. H. Firth. (Deceased.) 1918.
John Little, M.I.Mech.E. (Deceased.) 1919.
Matthew Riddle. 1920.
Oliver Stubbs, M.I.Mech.E. (Deceased.) 1921.
H. L. Reason, M.I.Mech.E. 1922.
Oliver Stubbs, M.I.Mech.E. (Deceased.) 1923.
R. O. Patterson. 1924.
J. Cameron, J.P. 1925.
V. C. Faulkner, M.Inst.M. 1926.
J. T. Goodwin, M.B.E., M.I.Mech.E. 1927.
S. H. Russell. 1928.
Wesley Lambert, C.B.E. 1929.
F. P. Wilson, J.P. 1930.
A. Harley. 1931.

HON. TREASURER:
W. B. Lake, J.P.

TRUSTEES:
F. J. Cook, R. O. Patterson and A. Harley.

GENERAL SECRETARY AND GENERAL OFFICE.
T. Makemson, Assoc.M.C.T., St. John Street Chambers, Deansgate, Manchester.

MR. VICTOR STOBIE
(President of the Institute of British Foundrymen).

THE INSTITUTE OF BRITISH FOUNDRYMEN.

Members.	
Honorary	16
Members	737
Associate members	991
Associates	135
Subscribing firms	47
Total	1,926
Branches	10
Sub-sections of Branches	5
Junior Sections	1
Committees of General Council	5
Technical Committee and sub-committees	8
Branch meetings during 1932	119
Papers presented.	
Cast Iron	19
Steel Founding	10
Non-ferrous	9
Malleable Cast Iron	2
Moulding and Patternmaking	24
Sands and Refractories	10
Furnace Design and Practice	9
General Discussions	9
Miscellaneous	10
Total	102
Activities.	
Works visits	34
Nationalities represented in membership	11
Countries in which members are resident	17
Finance.	
Invested funds	£1,500
Bank balance	750
Total	£2,250

The Jobbing Foundries in 1932.

By ROY STUBBS (Vice-President of the Institute of British Foundrymen).

THE Englishman is not usually given to introspection, nor is he troubled with any lack of confidence in his own powers of achievement. Throughout the nineteenth century Britain's commercial, military and territorial power showed uninterrupted expansion and the permanence of her wealth and influence were accepted—at all events in this country—as an established fact. But the sick man is assailed with doubts which never trouble the healthy. It is apparent to the most casual observer that the vitality and prosperity of the founder has been seriously impaired, and we are beginning to wonder if the zenith of achievement has been passed, whether the political and economic transformation which have ensued upon the Great War have not in the end been to the disadvantage of the victors, and whether the tremendous exertions of that great struggle have not so impaired our energies as to render us incapable of responding to the needs of a new age, which demands new methods.

Has an over-industrialised Britain become incapable of supporting itself by trade when caught in the fork between newly-formed foreign tariffs and the ever-increasing efficiency of foreign rivals?

Civilisation without metals is inconceivable. Metal working is the basis of culture and of all arts, and to a large degree the welfare of a nation is advanced in proportion to the state of perfection realised in its metal-working industry. Are we losing our place in the race of initiative and progress? The contemptuous negative can no longer be tendered to such questions as these. The founder of to-day is assailed with a dangerous mood of fatalism and disillusion which is paralysing energy and will power.

The real issue in the entire field is whether or not the industry is adapting itself to new conditions. Is it so fatally enmeshed in traditional habits as to be unable to conform to the more strenuous requirements of the new era?

The virtues of tenacity and skilled craftsmanship are not lacking, but even tenacity may be a handicap. Employers and workers are reluctant to admit that their old ways are not good enough. The progress of design advances so rapidly that what is new to-day may be considered obsolete twelve months hence.

To attribute all our economic troubles to the world slump is easy, erroneous and dangerous. The international complications of the day emphasise anew the interdependence of trade, the delicate complexity of world finance, and the utter inability of mankind to confine prosperity or poverty within national boundaries. While the causes are a matter of general concern, our own problems are sufficiently urgent to call for our special attention.

Castings are being demanded of more intricate character, lighter construction and with a higher quality of surface finish, and to be readily machinable at speeds much greater than hitherto. The founder is expected to greet these conditions by selling his wares at a lower price than ever. To attempt to cope with these conditions the progressive founder has been compelled to think very seriously how to so improve his methods of production as to enable him to satisfy the insistent demands of the consumer and meet

MR. ROY STUBBS
(Vice-President, Institute of British Foundrymen).

the fierce bogey of competition. Yet often he retains outworn plant hoping against the hope that somehow it may earn profits to pay off old overdrafts and avoid new ones, and to recover vanished prosperity. It is clear to the impartial observer that much of this plant cannot and ought not to survive.

A Tool-Room Personnel.

The foundry-equipment engineer has invented numerous improvements and developments which are quite equal to if not better than those of any of his foreign competitors, such as continuous-moulding plants, electro-magnetic moulding machines, vertical core stoves; drying in less time with greatly decreased fuel consumption; the rotary type of furnace using pulverised coal, recuperative oil-fired furnaces for special mixtures; centrifugal casting machines for gear wheels, rings, etc., core and mould blowing machines; sand preparation and handling, sand ramming machines, automatic cupola charging cranes, none of which have been taken advantage of to anything like the degree anticipated owing to the acute financial malaise. With the assistance of all or any of the foregoing aids the economies which can thus be realised vary enormously in different foundries, and are obviously greatest in works producing more or less standardised commodities. The increase in mechanisation of all kinds compels the foundry to have practically speaking, a tool-room personnel to keep everything tuned to the required state of efficiency.

In certain cases steps have been taken to try to reduce costs and losses through amalgamation of existing foundries; this rationalisation reduced to its simplest terms is nothing more than the application to industry of a scientific technique of reducing costs by eliminating waste. Some firms have found it expedient to close their foundries and buy their castings outside. The past year has seen competition keener than ever before, and to avoid closing down altogether through lack of orders many small firms have made drastic reductions in selling prices, and every founder has been compelled to follow this lead, which had spread through the industry. The depression has been further accentuated by the fact that a number of engineers possessing well-equipped foundries have produced, in order to keep going, all kinds of castings which were outside their usual programme, and which resulted in an increase in their production costs and further losses to the jobbing founder.

Foundries have seen considerable inroads made in their product by stampings, die-castings and welded structures. And with the low prices now current this has no doubt helped the latter to extend his activities to the further detriment of the foundries.

Nevertheless, some foundries have been developing and extending the scope of their activities by quiet and continuous experimentation and have everything in readiness to deal with greatly increased output when the time comes, which proves that they still have faith in the future of the industry.

One can only hope that in spite of the melancholy commercial conditions that have prevailed during 1932 optimism will temper our impatience for an early return to adequate remuneration for our products. And a day of reckoning must surely arrive! Success will come, and it will come from the persistence of those qualities which have made our country great. By hard work, patient pertinacity, imagination and rigorous leadership, we can and must "win through."

A Novel Portable Furnace.

Messrs. Wm. Cumming & Company, Limited, of Glasgow, who, as is well known, have branch works and offices at Falkirk, Chesterfield, Deepfields and Middlesbrough, have placed upon the market a new design of small furnaces which should prove of inestimable value for emergency shops where rush jobs are a speciality. Moreover, in other foundries where space is limited, or where demands for small castings are intermittent, it should be a real need.

The Cumming Furnace can be used either as a portable unit or by means of a heavy plate fixed permanently to the floor. It can satisfactorily replace the pit type of furnace.

The furnace is designed to take a 60-lb. pot, but if desired this capacity can be increased by the addition of extra sections. The furnace has a sliding cover, and the advantage of this is that it acts as a preheater, has a quick action, and when the furnace is charged it is not necessary to remove the cover until the metal is ready for pouring. Another point is that when the furnace is once charged it requires very little attention.

In actual test it has been found that from the moment of lighting the fire till the pouring of the metal (brass in this instance) exactly twenty minutes elapsed, and with regard to the life of the pot, which is an important matter, it may be noted that one pot has been in actual use in the test furnace for over five months without change, and the melts have included brass, iron, aluminium and other alloys.

Demonstrations of this new furnace can be witnessed at some of the company's works, and it may be mentioned that the article is wholly British, manufactured in England, and in the British Isles sold only by Messrs. Cumming.

The Pig-Iron Industry in 1932.

By A. C. MacDIARMID (Chairman, Messrs. Stewarts & Lloyds, Limited).

Table I shows the production of pig-iron by grades in the United Kingdom. The total production in 1932 for the United Kingdom was 3,555,000 tons, as compared with 3,772,600 tons in 1931 and 10,260,300 tons in 1913. These figures are in themselves disappointing.

On the facing page is Table II, which shows the production of the world divided into countries and expressed in percentages of the total for the years 1928, 1929, 1930, 1931 and estimated figures for 1932; also as a comparison the pre-war period, 1913. An examination of these figures discloses the fact that although the United Kingdom figures are disappointing, our position has gradually improved since 1928 as compared with other countries, with the exception of 1931, when Continental competition was at its height. This has been corrected by the imposition of tariffs and the depreciation of sterling.

Generally speaking, the prosperity of a country or an industry is dependent upon its ability to export in competition with other exporting countries. Table III (facing page) shows the exports of the countries of the world expressed as a percentage of the total for the years referred to. The increase in 1932 appears to be due to depreciated sterling.

Table IV shows the United Kingdom foreign trade balance in tons. It will be noticed that the position in 1932 is better than in 1931, but substantially worse than in any previous year. This position is particularly noticeable in the case of foundry iron, but it is pleasing to note that the first nine months of 1932 showed a favourable trade balance.

In summarising the information supplied by the above tables, I think it is clear that the depreciation of sterling and the imposition of tariffs have together proved to be a turning point in foundry-iron production, and the indication is that the trade may look forward to improved conditions in 1933.

HOW THE INDUSTRY IS OPERATING.

Number of Furnaces in Blast on December 31, 1932.

District.	Average in blast for quarter.	Total in blast on Dec. 31 1932	Total in blast on December 31 making			
			Hem.	Forge & Foundry.	Basic.	Ferro-man., etc.
Scotland	15/16	15/16	—	1	1	—
Durham and Northumberland	15/16	15/16	—	—	—	—
Cleveland	13 1/16	13	5	1	7	—
Northamptonshire ..	6 1/16	6	—	5	1	—
Lincolnshire	7	6	—	1	5	—
Derbyshire	7	7	—	7	—	—
Notts and Leicestershire	2	2	—	2	—	—
S. Staffordshire and Worcs.	4 1/16	4	—	2	2	—
North Staffordshire ..	2	2	—	1	1	—
West Cumberland ..	4 1/16	4	4	—	—	—
Lancashire	3 1/16	5	3	—	2	—
South Wales and Mon ..	3	3	1	—	2	—
South and West Yorkshire	3 1/16	3	—	2	1	—
Shropshire	1	1	—	1	—	—
North Wales	1/16	—	—	—	—	—
Gloucester, Somerset & Wilts.	—	—	—	—	—	—
Totals	62 3/16	60	15	23	22	—
Totals for previous Quarter	60	58	10	25	21	2

TABLE IV.—*United Kingdom Foreign Trade Balance,* 1913 *and* 1928–1932.

	1913.			1928.			1929.		
	Imports.	Exports.	Excess of exports over imports.	Imports.	Exports.	Excess of exports over imports.	Imports.	Exports.	Excess of exports over imports.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Pig-iron—Acid ..	107,480	242,117	134,637	2,599	158,668	156,069	2,628	246,904	244,276
Basic ..	30,177	2,264	(–) 27,913	46,358	1,297	(–) 45,061	71,886	9,685	(–) 62,210
Foundry ..	47,117	700,881	653,764	38,718	231,513	192,795	45,518	194,497	148,979
Forge ..	—	—	—	6,028	5,217	(–) 811	1,989	4,504	2,515
		1930			1931			1932 (1st 9 months)	
Pig-iron—Acid ..	205	126,923	126,718	124,346	108,503	84,157	18,411	32,245	13,834
Basic ..	171,673	780	(–) 170,893	149,730	42	(–) 149,688	69,984	1,043	(–) 68,941
Foundry ..	117,508	138,380	20,872	109,364	80,071	(–) 29,293	26,493	55,244	28,751
Forge ..	1,142	5,104	3,962	499	1,573	1,074	240	1,109	869

Total Excess of Exports over Imports.

Year	Tons.
1913	760,488
1928	302,992
1929	333,562

Total Excess of Imports over Exports.

Year.	Tons.
1930	19,341
1931	93,750
1932 (9 months)	23,487

The Present Position of the Large Jobbing Foundry.

By R. GREENWOOD (Managing Director, Craven Brothers (Manchester), Limited).

THERE are two kinds of jobbing foundries—those which are fit for foundrymen to spend one-third of their lives in, and those which are not. Many foundries with dilapidated buildings, ill-lit and badly ventilated (or only ventilated through broken windows and holes in the roof), and not always watertight, and with stoves full of soot from open fireboxes, shops inadequately equipped with lifting machinery suitable to the work undertaken, have recently gone out of business. Some still remain in business, and it is to be hoped that they will be closed quickly and quietly, to nobody's regret.

About five years ago the engineering business which the writer controlled at that time, was so busy that it was necessary to order castings outside, and we sent out inquiries for a number of castings weighing 5 tons each. We placed the order, at the price quoted, with a neighbouring jobbing foundry, which foundry was well known, had a good reputation and had been in business for 60 years. The author asked them to give him an opportunity of inspecting the first casting before it was delivered, and, in due course, he visited their works for this purpose. The casting was a very sound and creditable job, but he was astounded to see the plant. This particular casting of 5 tons had been made in an annexe to the foundry proper. The crane serving the annexe was a hand-operated, overhead, wooden-beam structure, with the crab worked from the top by a number of men, depending upon the weight it was required to lift, and the shop was dark and dirty. It was quite impossible to turn over the top part for finishing, so that it had to be lifted, travelled along the shop, logged up and finished, blacked and dried from underneath. The ladle had to be set down by the side of the job and 6 tons of metal had to be carried in shanks from the cupola 40 yds. away—altogether a fine example of determination and perseverance, but a wonderful object lesson of very bad business.

My definition of a jobbing foundry is " a foundry run for the purpose of making various

castings up to its capacity" or "an engineers' foundry engaged in making high-class castings of a constantly varying type." Such a jobbing foundry, whether it is engaged in the production of iron, steel, malleable or brass castings, ranks in the author's opinion above, and not below, the repetition shop, no matter on what class of work the latter is engaged.

This is because the modern jobbing foundry depends in a large measure for its success on the skill and experience of highly-trained craftsmen, and on foremen and executives who are in the first place complete and all-round craftsmen moulders, who have acquired technical training and general foundry knowledge. It will be allowed that whilst an engineer, a chemist or a patternmaker frequently makes a good manager of a repetition or a mechanised foundry, he is not so successful as the manager of the real jobbing foundry unless supported strongly by practical experience. This is not to say that all moulders of skill and experience are fit to be foremen or managers. Alas! no. Proportionately, very few are, but those moulders who have had the skill and the education have seldom been kept on the floor, and the work of these men is the foundation on which the production of satisfactory castings in a jobbing shop must be built.

The Institute of British Foundrymen has probably done more than any other educational institute or college to raise the status of the first-born and least-respected member of the engineering family, and this, I think, explains why we are now finding more of the aforetime foundry apprentices occupying executive positions. The response from the moulders and coremakers, however, is still unsatisfactory, and it is a great pity because more general technical training would make it so much easier to get new ideas accepted with enthusiasm in the shop, and there is still plenty of scope for new men and new methods in the foundry.

The Pig-Iron Industry in 1932.

(Continued from previous page.)

TABLE I.—*United Kingdom Production of Pig-Iron for Years* 1928–1932 *and* 1913, *Expressed as Percentages.*

	1928.	1929.	1930.	1931.	1932 (Partly estimated).	1913.
	Expressed in percentages of the total.					
Hematite	32.36	30.94	29.73	23.30	21.83	35.13
Basic	36.80	42.12	38.88	38.05	43.66	24.66
Foundry	23.28	19.41	23.15	30.58	28.63	36.05
Forge	4.06	3.63	4.56	4.63	3.73	3.16
Other qualities (including alloys)	3.50	3.90	3.68	3.44	2.15	
Total	100.00	100.00	100.00	100.00	100.00	100.00
Tonnage (in thousands of tons)	6,610.1	7,589.3	6,192.4	3,772.6	3,555.0	10,260.0

TABLE II.—*World Production of Pig-Iron Expressed as Percentages of the Total.*

Country.	1913.	1928.	1929.	1930.	1931.	1932 (estimated).
United Kingdom	13.20	7.52	7.79	7.82	6.85	9.19
Germany	13.77	13.22	13.54	12.04	10.85	9.81
France	11.46	11.18	10.48	12.48	14.66	14.06
Belgium	3.14	4.32	4.09	4.17	5.70	6.97
Luxemburg	3.22	3.10	2.94	3.06	3.67	4.98
Saar	1.73	2.18	2.13	2.38	2.71	3.38
Total West Europe	46.52	41.52	40.97	41.95	44.44	48.39
Tonnage (in millions of tons)	37.23	36.49	39.89	33.23	24.46	18.75
United States	39.75	43.39	43.77	40.09	33.48	22.71
Other Empire countries	1.64	2.93	3.10	2.92	3.51	3.87
Other Foreign countries	12.09	12.16	12.16	15.04	18.57	25.03
World total	100.00	100.00	100.00	100.00	100.00	100.00
Tonnage (in millions of tons)	77.90	87.91	97.35	79.20	55.04	38.75

TABLE III.—*Exports of Pig-Iron Expressed as Percentage of Total World Exports.*

Country.	1913.	1928.	1929.	1930.	1931.	1932 (1st 9 mths)
United Kingdom	42.92	26.30	28.16	23.32	21.57	30.18
Germany*	38.28†	19.25	26.37	19.29	20.94	14.53
France and Saar*	5.03§	41.58	37.77	45.45	48.70	46.63
Belgium and Luxemburg*	0.75‡	6.45	7.37	9.76	7.87	8.02
United States	13.02	6.42	3.33	2.18	0.92	0.64
Total	100.00	100.00	100.00	100.00	100.00	100.00
Tonnage (in thousands of tons)	2,202.8	1,508.0	1,617.0	1,163.0	877.5	296.8

* The figures for these countries include ferro-alloys, except for 1932, which are pig-iron exports only.
† Includes Luxemburg and Saar.
§ France only. ‡ Belgium only.

Progress and development in the jobbing foundry cannot conceivably be expected to have advanced at the same rapid rate as in repetition or mass-production foundries, since the opportunities of standardising the practice, and the application of labour-saving machinery, is much less practicable, but it is certain progress is being made all the time.

The New Equipment.

The equipment in the general jobbing foundry to-day is a wonderful improvement on the equipment of the same foundry only a few years ago. Well-designed sand-preparing plant, simple and reliable in operation, has taken the place of the old pug-mill. Power riddles and sand projectors are in almost universal use. Moulds and cores are dried in scientifically designed stoves or portable driers. The designers understand the laws of combustion and the flow of air and gases, and the foundryman knows that he obtains more effective drying by the passage through the stove or mould of large volumes of gases at low temperature, than by a stagnant humid atmosphere, or an intense heat, such as he obtained from the open fire-box stove, or in the mould when dried by open fires. The clearing out of great quantities of ashes after firing very intricate moulds, and the consequent damage to the moulds and the necessary repairs to them, was always dirty, difficult and dangerous, and the elimination of this constitutes a considerable saving and improvement on older methods.

Greater attention is given to providing the moulder with suitable shop tackle. A well-designed selection of general utility moulding boxes for medium and fairly large work, obviates the necessity of a quantity of expensive bedding of patterns in the floor. The making of the joint on the same plane as the highest projection on the top face of the pattern, and the consequent necessity of making rising joints, and the gagging and ramming of deep lifts, is being eliminated or considerably reduced by the use of properly-designed general jobbing moulding boxes.

Moulds in boxes can be dried in the stove often without any additional cost, and dry-sand moulds are, in nine cases out of ten, very much cheaper to produce than *safe* green-sand moulds, besides producing better castings, whilst green-sand moulds are safer and cheaper to produce in boxes than by bedding in the floor. Cranes and lifting equipment are much improved, and the old cry of the moulder, "Five more for a lift," is not now heard in the modern jobbing shop. Electric and/or petrol trucks are in common use, and the mechanical grab is recognised as a useful piece of equipment for internal transport of sands, and in excavating moulding pits.

The use of moulding machines for small and medium-sized jobbing foundries, is becoming more general. The economical use of moulding machines for general work, however, compels consideration of other things, such as:—the provision of suitable box tackle; the making of patterns of a construction suitable for quick mounting upon the table of a moulding machine; it is preferable for patterns to be made with all the recesses in the top cored out, so as to provide a flat top part.

The equipment for tempering and renewing the sand supply and delivering same to the moulding machines, requires special consideration if the utmost production is to be obtained out of the machines.

Restrictions on Development.

It is feared that the use of moulding machines in jobbing foundries has been retarded by a failure to supply the necessary auxiliary service equipment which is required, and many good machines have become derelict and consigned to the scrap heap because the performance has been unsatisfactory for this reason alone. Oil-bonded sand has reduced the cost of cores, making elaborate venting unnecessary, and reducing the quantity and weight of lifting grids and core irons, besides making it possible to produce better and safer cores for general foundry use.

Evolution of Design.

Design is being given more careful study, and the drawing office, pattern shop and foundry, in collaboration, can eliminate freak design of castings. If, afterwards, the pattern shop and foundry continue the collaboration, patterns can be built specially to produce the cheapest and soundest castings. Sometimes it is more economical to block out a pattern and reduce the moulding costs; sometimes the additional cost of coremaking, plus setting, is greater than the extra cost of moulding; only an executive, experienced in foundry work, can correctly decide on these matters.

XUM

A Clean Shop.

Jobbing foundries are cleaner than hitherto. The management now frequently sees to it that the windows are washed, the walls swept down and whitewashed, the steelwork painted, the roofs cleaned free from cupola fines. It would be interesting to learn whether anybody has seen a completely satisfactory spark arrester? but direct replies are not solicited. All this, combined with a decent shop to begin with, has a psychological effect on everybody engaged in the department, so that the gangways are kept clean, the stockyards orderly, the coke from getting under foot, and broken boxes and loam plates are repaired or scrapped, and the lifting tackle is regularly inspected and the history of each lifting unit recorded.

Melting Plant.

In the melting house the supremacy of the cupola is being seriously challenged by the pulverised-fuel-fired furnace and the oil-fired furnace, many of which have been installed in this country in the past two years. Cupolas have been improved in design, and although it can be said with some truth, "The more they are altered, the more they remain the same," there is no doubt that improved melting practice has resulted in a very much improved product, and for a continuous supply of metal in varied quantities, it is difficult to see how the new furnaces can oust the cupola, particularly as under scientific and metallurgical control the cost per lb. of completely satisfactory hot metal into the ladle is lower from the cupola than from the new furnaces.

For special metals, conforming strictly to predetermined analyses, there is a big field for the new furnaces, as in this quality the cupola cannot compete.

In mechanised foundries, where it is possible to say exactly how much molten metal of specified quality will be required at a given time, and where the rotor of production can be maintained with clocklike precision, the new furnaces will probably displace the cupola, but as by far the greater weight of castings required are jobbing castings of a good, strong, uniform closeness, with good wearing qualities, rather than great tensile strength and toughness, the up-to-date jobbing foundry will be very reluctant and slow to replace cupolas by new-type furnaces, probably quite rightly.

The jobbing foundry is indebted for much of its mechanical equipment to the repetition and highly-mechanised foundries, where the immense impetus in the production of huge quantities of really wonderful castings in the past few years has been obtained by a rapid development of moulding, core-making and cleaning machinery, allied with conveying plant of the continuous-flow type, to supply the intense demand of the luxury trades, which have been almost the only trades demanding great quantities of machine-produced castings.

The author cannot visualise any further rapid acceleration in the development of machinery for the repetition foundries. More of the type of plant now available will be installed. There will be a slowing-down of invention of new devices, and greater attention given to perfecting those existing. On the other hand, the jobbing foundry will make much further progress in the next ten years, and the modern British jobbing founder will go on producing the best-quality castings in the world, metallurgically, scientifically and practically.

Price-Cutting.

Several of the Branch-Presidents of the Institute of British Foundrymen have recently called attention to the evils of price-cutting, and the folly of accepting orders, nay, begging for orders, at what we call "uneconomic" prices. It is a big subject and the founders, if guilty, are entitled to plead extenuating circumstances, inasmuch as they have only been doing what every other section of the engineering industry has been doing in the past few years. We are all buyers and sellers. When we buy we squeeze the other fellow, and when we sell the other fellow squeezes us, and when we resist (as some

MR. R. GREENWOOD

(Managing director of Craven Brothers and a director of Sir W. G. Armstrong Whitworth & Company (Ironfounders), Limited).

of us have resisted strenuously and continuously with spirit), we see our friends in the same line of business accept the squeeze and the job.

It is a vicious business, and it permeates every section of productive industry to-day, except perhaps the luxury trades, which seem to have escaped as sellers. When the luxury trades buy manufacturing plant from the engineers they purchase as keenly as everybody else. The slogan to-day is, "No purchase without parley." Many founders have gone out of business, it is true, but probably not entirely and solely due to uneconomic price-cutting. An uneconomic price to one founder is a very good price to another who may be better equipped and more efficient in his methods and who only takes work within his capacity. Actually 12s. may be a good price for 1 cwt. of castings if a shop is working to 100 per cent. capacity, and the same price may be a losing one if your shop is only working to 20 per cent. capacity, and founders cannot really expect the buyer to purchase their products if he can get an equally satisfactory job from somebody else at a better price. If a founder knows his costs and can take out an estimate, he knows whether or not his price is an economic one, and if it is not an economic price it is not an ethical price.

The author believes in limited control in any industry to prevent prices falling below the economic level of the efficient manufacturer by the action of first one and then another of the inefficient people who could not get an order at their own economic price. The worst type of unethical seller (who is usually the inefficient manufacturer) should be eliminated, and the uncontrolled economic conditions of the past few years have certainly removed a few of these people from the scene of their crimes. How to apply the limited control is another matter.

If and when founders are able to work their shops continuously at a high capacity, say from 80 to 100 per cent., it is felt that they will find that there is nothing very much the matter with general prices to-day. The author subscribes to the principle of selling all the time at the lowest possible price, which includes full costs and reasonable profits, enabling one to pay a fair return on the capital employed in the business and put some money back into the business every year in the purchase of new and more up-to-date plant and equipment, and to repair wastage.

If others can produce our product and make full costs and reasonable profits, and still sell at a lower price than we do, there must be something the matter with us, so that we must either improve our methods or go out of business. If, however, we accept the challenge and sell at a lower price than he offers, and we do not improve our methods, we shall go out of business just the same; the process will, however, be longer, and we shall do a lot of harm to many other people in the meantime.

Low prices are always justified if the company quoting can deliver the goods and make a profit on the transaction. Low prices on which the quoter loses money are not justified, and such people are a menace to their own business, to the industry in which they are engaged, and to the nation.

Italian Foundry Industry in 1932.

(Concluded from page 42.)

Government supports in many ways the development of this industry, with a view to substituting iron alloys by those of aluminium whenever possible. There are numerous foundries for light alloys in Italy, but only about ten of any importance which make both sand and die-castings. There has been a considerable development in the use of aluminium alloyed with silicon, copper and Ni, the last for withstanding high temperatures, as in automobile piston and similar practice. Other aluminium alloys are made for resisting sea-water corrosion and, after heat-treatment, for high-tensile purposes. Although the cost of electric power in a country like Italy, rich in waterfalls, is relatively low, it is still too high for the use of electric furnaces for melting light alloys for foundry practice.

STEEL CASTING PRODUCTION IN ITALY.

	Tons.
1913	16,000
1922	24,940
1923	42,212
1924	34,621
1925	58,248
1926	49,603
1927	51,188
1928	51,700
1929	52,607
1930	54,510
1931	45,562
1932 (est.)	40,000

There is no technical association of foundries in Italy, as in other countries. There are, however, the two associations to which the metallurgical and mechanical engineering works belong. These look after economic interests and study technical questions. In these difficult times, however, the activity of the associations is chiefly taken up with the economic rather than technical considerations. Scientific development in foundries in Italy has, up to now, been left entirely to private individuals and enterprise, and the results obtained are to be credited to these rather than to any organisations of a scientific character. In the various contacts which Italian foundrymen have had in the past years with those of other countries, especially at International Congresses, this lack in Italy has been acutely felt, and at the present moment a commission is studying the possibility of forming a foundry technical association in Italy.

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[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Fiscal Policy Joint Committee, Brass, Copper and Nickel-Silver Industries.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I would advise you that this Committee was formed over a year ago and represents the whole of the non-ferrous metal-trade associations. There is also a Joint Committee, which meets in London, of consumers and Empire copper producers—the representatives of the former having been appointed by the Fiscal Policy Joint Committee—the function of this London Committee being to advise the Government in regard to requirements, use and supplies of unwrought copper.

As a result of the activities of these Committees, the Agreement between consumers and Empire copper producers, made on October 26 last and reported in the Press, was entered into. That Agreement contains an undertaking by United Kingdom consumers that they will, as far as lies in their power, purchase copper from Empire producers in preference to non-Empire suppliers; and the Agreement also provides that a technical sub-committee will be maintained by the consumers to assist in securing suitable supplies of Empire copper.

A technical sub-committee was appointed by the main fiscal policy Joint committee in August last for the purpose of preparing a statement showing the British requirements of unwrought copper, which statement was well received by the trade, the producers themselves and the Government.

The "Technical Committee" which the consumers have undertaken to provide has now been constituted by continuing the existence of the technical sub-committee above mentioned, with additions to its membership, and is now composed as follows:—

Mr. A. J. G. Smout (Birmingham), chairman, Dr. L. Aitchison (Birmingham), Mr. W. E. Alkins (Oakamoor), Mr. R. Lloyd Gibbins (Birmingham), Mr. E. A. Medley (Manchester), Mr. Geo. W. Mullins (Birmingham), Mr. J. Smith (Widnes) and Mr. J. Lester Smith, secretary.

It is understood that these gentlemen officiate as representing the whole of the trade and not as representing companies or associations.

The purpose of this committee is to study and discuss all metallurgical problems arising out of the intended change over from world sources of supply of unwrought copper to Empire sources only. The Committee will endeavour to assist the producers in their efforts to satisfy the consumers' needs in respect of quality. As an example of the problems anticipated, I may mention the possible unsuitability of Empire brands owing to their chemical composition either in regard to actual amount of impurities or in regard to irregularity thereof.

Your readers' co-operation in this direction will be appreciated, and they are invited to communicate to the undersigned any information or suggestions they may wish this Technical Committee to consider; their own experience in regard to the above kinds of copper from Empire sources and similar subjects; in doing so, they should indicate whether their name may be revealed to the Committee or whether they wish the Secretary to put the information before it impersonally.

The Technical Committee will meet at intervals according to the amount of business coming forward, and your readers may depend upon any communication they make being carefully considered. If necessary, and if permission is given for their name to be disclosed to the Committee, their attendance at its meetings may be invited. Again, if necessary, the Committee may call full or part meetings of consumers to receive communications. The Empire producers will be invited to collaborate, either direct or through the Joint Committee of Producers and Consumers, but no consumer's name will be revealed to the producers except at his wish.

You will appreciate that such a change in sources of supply as the Ottawa Agreements visualise will have an equal effect upon consumers outside associations as those inside—hence this invitation to all non-members for technical co-operation.

In the meantime, should any of your readers desire any further information with regard to the various committees mentioned, or their activities, I will endeavour to furnish this upon request.—Yours, etc.,

For Fiscal Policy Technical Sub-Committee,
J. LESTER SMITH,
Secretary.

Kings Court,
115, Colmore Row, Birmingham, 3.
January 16, 1933.

Book Review.

Aluminium and Its Alloys, by N. F. BUDGEN, Ph.D., M.Sc. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 15s. net.

In his preface the author refers to "this small book," yet it runs to 270 odd pages, and, to our mind, is worthy of a better designation. Just because it is not highly academic there is no excuse for such modesty. An outstanding feature of this book is its literary merit. Unlike many of we technicians, Dr. Budgen can write really well. As indicated, the book is elementary and can be easily understood by anyone who has dabbled in metallurgy. As works of this character have to last quite a time, we think the graph on page 4, showing the world output, might have been brought more up to date than 1927. The scope of the book is exceeding wide, as it takes the subject from the ore to finishes obtainable on aluminium and its alloys. A feature of the book is the large number of illustrations, actually 150, which have been incorporated. Chapters II to IV outline the methods of production of pure aluminium, in a really interesting and informative manner; whilst Chapter V is full of valuable notes on its behaviour in contact with various substances of a corrosive character. Next we are given a survey of the preparation of aluminium alloys and their properties, including copper, silicon, zinc and alloys with other metals. In Chapter VII the author covers the important subject of the heat-treatment of aluminium alloys. We think it would have been interesting to record how Alfred Wilm sent a consignment of duralumin to Sweden and how the properties had changed during the journey and the consequential discovery of age-hardening. It would have well suited this type of text-book, which has devoted so much care to the historical side. Readers will be, perhaps, a little surprised to learn that this lengthy section is followed, and not preceded, by "the casting of aluminium alloys." However, as the best wine is often served later in a meal, there can be no grumble. It discloses much practical information about die-casting, moulding sand, casting temperatures, runners and risers, and welding. Chapter IX takes a step further back to melting and alloying procedure. Figs. 77 to 85 illustrate typical furnaces used for melting aluminium. Most of them are reproduced by courtesy of the various suppliers. We think that no exceptions should have been, because even in a text-book these illustrations have a certain advertising value, especially as the author expresses a preference for oil over gas.

Chapter X is quite short, but adequately covers the question of the recovery of foundry waste. The next section is devoted to rolling, drawing, forging and extruding aluminium and its alloys.

(Concluded on page 66.)

Random Shots.

Most of us have read the efforts of paragraphists in our daily and weekly newspapers and must have been astonished at:—

(A) The number of meals and drinks consumed by the writers.
(B) The diversity of places they visit during the course of a day (and night).
(C) The hordes of really too interesting people they meet.
(D) The sheer uselessness of it all.

However, as this is a fashionable journal, we must move with the times and give to our readers those chatty little titbits without which no paper with a circulation is complete.

* * *

The title of this masterly reflection of life of the "hoi polloi" is

"FILINGS."

While breakfasting at my flat in Jermyn Street yesterday morning I was called to the telephone (new pattern, 1s. 3d. per qr. extra you know) by Colonel Rammer, who told me that he had received several severe jolts lately, but he was bearing up, as he felt that it was all in the interests of progress. Later in the morning I joined the Colonel for a shoot in Yorkshire. After I had bagged my braces I met dear old Lord Tuyere, who seemed to be feeling the draught somewhat. His shooting met with no reward, and after listening to his picturesque language for some time I ventured to suggest that his Lordship might balance his blasts.

* * *

I slipped across to Blackpool for lunch with some Lancastrian friends of mine, and afterwards, in the Tower Ballroom, I danced with Miss Ganister, who was looking a trifle pasty I thought. To cheer her up I gave her a hearty slap, knowing, of course, how used she is to such treatment.

* * *

I flew over to Paris to take "fif-oclok" tea with Madame Cupola, who appears to have a much neater figure than she had years ago. She tells me that her charming daughter Cupolette is suffering from overwork. Back in dear old London in time for a cocktail party, where I met some most interesting people, including the Earl of Pigg, whose fracture is now much better. He has been analysed, but is not at all in favour of what he calls a new-fangled method of finding out what is wrong (or right) with him. I was late for dinner at the Emperor, but the pleasure of meeting Miss Greene-Sand amply repaid me for the partial loss of my meal. She is a loosely-built girl, full of grit, and as sharp as a needle. She is very fond of treacle, and declares that it is the only thing that keeps her together. Later, when dancing, I remarked how dark she had become, and she explained that it is because of the life she leads.

* * *

I looked in at Tampico's for a drink, and saw Scrapp, who is very much in evidence these days. He has made himself too cheap lately; I never did like the fellow—he's such a mixture. Sir Harry Coke joined our party for supper. He has a breezy way with him, although he dislikes being reminded of it. His wife, Lady (Furnace) Coke is a blond of the ash variety and a woman with a hard nature. The Slags were also with us. They seem such useless people, and yet, somehow, they always rise to the top of everything they are mixed up in. They are very friendly at the moment with Sodrash, whom you may have heard of.

* * *

Finally, at 3 o'clock this morning I called at my favourite coffee-stall, and was joined by young Moulder, who had been doing some boxing. He knows quite a number of people in my world. How curious.

MARKSMAN.

Sterling

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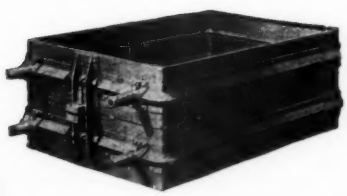

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You will halve your moulding costs. You will increase production per man per hour, and reduce your box maintenance costs. You will turn out more accurate castings and thereby reduce your scrap and reject accounts. You will considerably reduce your fettling costs and put money into your pocket that is now running to waste.

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BEDFORD.

This Week's News in Brief.

Trade Talk.

THE SKODA STEELWORKS at Pilsen are to restart production in the middle of January.

THE FORGES ET ACIÉRES DE LA SARRE decided at a recent extraordinary meeting to change its name to Société Anonyme de Vente des Aciers Fins de Lorraine et Sarre ("Lorsar").

THE ITALIAN ILVA CONCERN has come to an agreement with the U.S.S.R. Government to exchange 50,000 tons of Italian pig-iron and steel for 150,000 tons of Russian iron and manganese ores.

TO COMMEMORATE the life and work of James Watt a memorial institute is to be opened in York House, Great Charles Street, Birmingham, which will provide a meeting hall and library for the various engineering societies.

THE TENDER of Messrs. Braithwaite & Company, Engineers, Limited, has been accepted by the Swansea Borough Council for the supply and erection of 6,000 tons of structural steelwork for their new power station.

IT IS ESTIMATED that at December 19, 1932, there were approximately 9,457,000 insured persons aged 16-64 in employment in Great Britain. This was 84,000 more than a month before, but 148,000 less than a year before.

MESSRS. GREENWOOD & BATLEY, LIMITED, Albion Works, Leeds, have purchased recently the goodwills, patterns and drawings of Messrs. John Hands & Sons, Limited, and Messrs. Hollings & Guest, Limited, of Birmingham.

MESSRS. FERGUSON BROTHERS (PORT GLASGOW), LIMITED, have received an order to build a coasting vessel for the Light Shipping Company, Limited, Greenock (Messrs. Ross & Marshall, Limited, managers). The vessel will be engined by the builders.

MESSRS. BARCLAY, CURLE & COMPANY, LIMITED, Glasgow, who are associated with Messrs. Swan, Hunter & Wigham Richardson, Limited, Wallsend-on-Tyne, will build two large sets of Diesel engines for installation in the "spec" motorship which the Tyne firm are to build. The work will be carried out at the North British Engine Works, Whiteinch, Glasgow.

THE STAFF AND EMPLOYEES of the following firms have made contributions to various charitable institutions for the year ended December 31, 1932:—Messrs. Lane & Girvan, Limited, Bonnybridge, £124 11s.; Messrs. Archibald Baird & Company, Limited, Clyde Steel Foundry, Hamilton, £84; Messrs. Stewarts & Lloyds, Limited, works and offices in Glasgow and district, £3,157 17s. 1d.

MESSRS. SCOTTS' SHIPBUILDING & ENGINEERING COMPANY, LIMITED, Greenock, have booked an order for a large passenger and cargo steamer for a firm of London shipowners. The particulars of the vessel are not yet available, but Messrs. Scotts will also supply the machinery. This order is a welcome addition to the Admiralty contracts which the firm have in hand, and will mean employment for a large number of men in a district which has suffered severely from the shipbuilding slump.

THE NEW CARGO STEAMER "Harlingen," built for Messrs. J. & C. Harrison, Limited, London, by Messrs. Lithgow, Limited, Port Glasgow, has carried out very successful trials on the Clyde. The vessel is the fourth of the same type built at Port Glasgow for Messrs. Harrison. She is 440 ft. in length, 56½ ft. in breadth, with a deadweight capacity of 9,800 tons. Propelling machinery, consisting of triple-expansion engines, was supplied by Messrs. David Rowan & Company, Limited, Glasgow.

THE METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED, in a report of their activities in 1932, state that eight electric winders for export each with a nominal rating of 1,000 h.p. or over were in hand or completed, together with a number of smaller equipments. The firm also have under construction a 5,000/13,000-h.p. mill motor and generating equipment for a reversing blooming mill at Izhevsk, a 1,200-h.p. motor and generating equipment for a piercing mill in connection with a tube mill at the Karl Liebknecht works; also an equipment, including a 2,000-h.p. motor, for a piercing and Pilger mill plant for rolling weldless steel tubes for Taganrog steelworks; a 2,200-h.p. motor, with generating equipment, for a similar mill for Mariupol works; and a 2,000-h.p. motor to drive a tube mill for Dnepropetrovsk. Further mill plant includes a 2,500-h.p. motor and an auxiliary 800-h.p. mill motor for a roughing and finishing-mill equipment for Vato works; and two 250-h.p. motors and equipment for a plate mill at Mariupol works. The company also have supplied electrical equipment for a completely automatic blast-furnace equipment for the Workington Iron & Steel Company, and a sequencing gear for the bells and distributor and sounding rods for a steam-driven hoist for the Staveley Coal & Iron Company, Limited.

Personal.

LIEUT.-GENERAL SIR GEORGE MACDONOGH has been nominated to succeed Sir George Beharrell as President of the Federation of British Industries for the coming year.

MR. F. W. CARR, works manager at the Darlington locomotive works of the London & North Eastern Railway, has been appointed works manager at the Gorton locomotive works, in succession to Mr. J. W. Smith, who retired at the end of December. MR. L. FARR, assistant works manager at the Darlington locomotive works, succeeds Mr. Carr.

MR. N. ELMSLIE, H.M. Senior Trade Commissioner in South Africa, is now in this country on an official visit. Mr. Elmslie will be available at the offices of the Department of Overseas Trade during the period January 30 to February 4, for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to the Union of South Africa and to Southern Rhodesia. Mr. Elmslie will also visit a number of industrial centres in the provinces.

MR. A. E. MASCALL, who until recently was in charge of the departments responsible for the production and machining of all classes of forgings and the rolling of armour plates and many other products of the Atlas Works of Messrs. John Brown & Company, Limited, Sheffield, and who relinquished that post when the Brown-Firth merger had been two years in operation, has been appointed general manager of the Parkhead Works of Messrs. William Beardmore & Company, Limited.

Wills.

HUGHES, JOHN, of Gorseinon, ironfounder	£18,020
AUSTIN, G. R., of Sheffield, retired steel manufacturer	£18,169
MACFARLANE, WALTER, ironfounder, Saracen Foundry, Glasgow	£79,620
ROBERTSON, JAMES BOWIE, coppersmith and sheet metal worker, Paisley ...	£20,004
DOBBIE, GEORGE, ironfounder, Dobbie Forbes & Company, Limited, Larbert	£183,274

Obituary.

MR. JOHN WILLIAM SYKES, managing partner of the Perseverance Foundry Company, Ings Mill, Heckmondwike, has died at the age of 65.

THE DEATH OCCURRED at his home in Bonnybridge, on January 7, of Mr. George M'Lay, who was for many years employed by Messrs. Smith & Wellstood, Limited, Bonnybridge, in charge of the packing department. He retired a few years ago, and was in his 83rd year.

COLONEL WILLIAM SIDEBOTTOM died at his home at Broadbottom, Cheshire, recently, at the age of 92 years. For 15 years Colonel Sidebottom was associated with the board of directors of Messrs. Cammell, Laird & Company, Limited, as director, deputy-chairman, and chairman. He joined the board in 1896; in 1901 he became deputy-chairman, and in 1904 chairman. He resigned the latter position in 1905, but in 1909 and 1911 he again acted as chairman. He retired from the directorate in 1917 owing to advancing years.

"Bendalloy."—According to a recent issue of "Steel," this is the name given to an alloy specially developed for use in the bending of tubes. It consists of bismuth, lead, tin and cadmium and fuses at 160 deg. Fah. It is specially suitable for bending tubes of copper, duralumin, aluminium and brass.

Contracts Open.

Johannesburg, January 30.—350 tons (2,000 lbs.) of hematite pig-iron and 80 tons (of 2,000 lbs.) cold-blast pig-iron, for the South African Railways and Harbours Board. The Department of Overseas Trade. (Reference G.X. 12,173.)

New Zealand, March 10.—Centrifugal pump, motor and accessories, for the Dunedin City Corporation. The Department of Overseas Trade. (Reference G.X. 12,177.)

Oswestry.—Water-turbine and centrifugal pump, for the Liverpool Corporation Waterworks. Mr. J. R. Davidson, water engineer, 55, Dale Street, Liverpool. (Fee £2 2s., returnable.)

Port Elizabeth, January 26.—Two large steam pumps, for the Municipality of the City of Port Elizabeth. The Department of Overseas Trade. (Reference G.X. 12,162.)

Iron and Steel Output in December.

There were 60 furnaces in blast at the end of December, one more than at the beginning of the month; four furnaces commenced operations, and three were blown out during the month. Production of pig-iron in December amounted to 284,500 tons, compared with 267,700 tons in November and 330,600 tons in December, 1931. The production includes 76,600 tons of hematite, 123,600 tons of basic, 68,000 tons of foundry, and 10,600 tons of forge pig-iron. The output of steel ingots and castings amounted to 430,400 tons, compared with 473,800 tons in November and 425,400 tons in December, 1931. The December figures bring the total pig-iron output for the year to 3,573,000 tons, compared with 3,772,600 tons in 1931 and 6,192,400 tons in 1930, and of steel to 5,256,800 tons, compared with 5,202,600 tons in 1931 and 7,325,700 tons in 1930.

Book Review.

Aluminium and Its Alloys.

(*Concluded from page* 64.)

This should be read very carefully by foundrymen, as it is obvious that the wrought material is replacing castings to a serious extent. The chapter on the uses and applications of aluminium is extremely interesting and particularly well illustrated. It constitutes the finest piece of publicity we have seen for extending the use of aluminium in industry in general. Once more we must object to the make-up of the book, as the next chapter goes right back to technology and deals with corrosion and protection. This, we suggest, should come before its "uses." By this lay-out, after convincing the engineer, architect or other interested person as to the potentialities of aluminium, attention is drawn to the not very serious question of protecting such structures or parts from corrosion. This last chapter includes some valuable notes on the anodic treatment.

Apart from arrangement of the sequence of chapters, this book is excellent and well worth including in the bookshelf of all foundrymen and metallurgists.

J. & E. HALL, LIMITED.—Net profit, £20,626; taken from reserve for investment depreciation not required, £15,000; brought in, £3,412; preference dividend, £9,000; ordinary dividend of 4 per cent., £22,400; carried forward, £8,138.

MESSRS. HENRY GARDINER & COMPANY, LIMITED, metal merchants, 2, Metal Exchange Buildings, London, E.C.3, have published a large coloured graph, of interest to the foundry trades, illustrating the extreme monthly fluctuations in the four base-metal markets during the years 1923-32 inclusive.

XUM

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C.N. 54

Raw Material Markets.

The iron and steel markets are showing signs of more activity, although actual buying is still very restricted. The demand for pig-iron is steadily expanding. The same cannot be said of finished steel, which is in a very poor position at the moment. There is a fair call for semis, nearly all of the orders placed going to the home works. The non-ferrous metal markets continue to suffer from a weak demand from industrial consumers, and the outlook in this section is very uncertain.

Pig-Iron.

MIDDLESBROUGH.—Export business in Cleveland iron is almost entirely at a standstill at the present time, while local consumers continue to buy on hand-to-mouth lines. According to several reports, a number of contracts have been fixed direct with Scottish consumers, who continue to enjoy a considerable rebate on iron from this district. The local foundries are still called upon to pay the full official rates, which are as follow:—No. 1 foundry, 61s.; No. 3 Cleveland G.M.B., 58s. 6d.; No. 4 foundry, 57s. 6d.; No. 4 forge, 57s. per ton.

The demand for East Coast hematite is poor, especially from overseas. Considerable stocks of iron were accumulated at home works over the holidays. Makers maintain their quotation at 59s. per ton for mixed numbers, but will not book ahead at this figure, which indicates confidence in the future.

LANCASHIRE.—A fair number of orders have been taken this week for pig-iron, but the total turnover is very limited at the moment. The jobbing foundries and the textile-machinery manufacturers report little improvement in trade, but more activity may shortly be looked for in the light-castings branch. A resumption of orders from Russia would make a considerable difference in the situation. For delivery to users in the Manchester price zone, Derbyshire, Staffordshire and Cleveland brands of No. 3 iron are offered at 67s. per ton, with Northamptonshire at 65s. 6d., Derbyshire forge at 62s., Scottish foundry at about 82s. and East and West Coast hematite at 76s. and 81s. per ton respectively.

MIDLANDS.—There is still little activity in this market. Few of the foundries are fully occupied, those engaged in the domestic and light-castings trades being the best situated. Stocks of unsold iron continue to increase, production being still in excess of demand. No. 3 Northants is at 62s. 6d., with North Staffordshire, Derbyshire and Lincolnshire No. 3 at 66s., including delivery to Birmingham and Black Country stations.

SCOTLAND.—Work has only been partially resumed since the holidays, owing to lack of business, and the outlook is not very good at the moment. Nearly all branches of the heavy industries are affected by the inactivity at the Clyde shipyards. In the absence of any appreciable demand, No. 3 Scottish foundry iron remains at 67s. 6d. per ton, with 2s. 6d. extra for No. 1, f.o.t. furnaces.

Coke.

Considering the period of the year, the foundry-coke market remains exceptionally quiet, in spite of the fact that makers are prepared to book well forward at current rates, which are:—Durham coke, 34s. to 38s.; Welsh coke, 30s. to 45s. per ton, according to analysis, delivered Birmingham and Black Country stations. A small number of prompt orders has been taken this week.

Steel.

Quiet but steady conditions rule in the steel markets and, although the recovery from the dullness of the Christmas and New Year holidays has not been so complete as was hoped, it has been sufficient to maintain the confident note with which the year started. In the semi-finished steel department there have been reports of substantial sales of foreign steel, but these have been greatly exaggerated, as a comparatively small tonnage of this material has been bought by British consumers for a long time past. Continental prices of late have shown an advancing tendency, largely as a result of the better understanding between the Continental manufacturers. So far as this market is concerned, however, the British buyers continue to take practically all the orders which are placed. Business in finished steel has been quiet but steady. The British home market has bought sparingly, and the absence of any important demand from the shipbuilding and engineering industries is severely felt. Export business is made difficult by foreign exchange restrictions, but, nevertheless, general export trade seems to be improving, particularly with Empire markets.

Scrap.

On the Cleveland market, owing to the improved demand, the price of ordinary heavy cast iron has advanced to 40s., machinery metal is at 41s. 6d., while light castings have realised 37s. per ton. In the Midlands 47s. 6d. is asked for machinery scrap and 36s. for clean light cast iron, delivered. There is an active demand in South Wales for heavy cast iron at 42s. 6d., with light cast iron at 37s. 6d. In Scotland machinery scrap in pieces not exceeding 1 cwt. is being bought by the foundries at 46s. to 47s. 6d., with ordinary cast iron at about 5s. less.

Metals.

Copper.—The market continues to suffer from a lack of trade demand, and quotations are showing little strength at the moment. Consumers now buy at intervals, stepping in at the bottom of each periodic fall in prices. The undulating trend of prices is accentuated by the big producers' policy of only releasing small supplies at a time, which are quickly taken up. This state of affairs will probably continue until the British duty on foreign copper is finally put into force, in anticipation of which the Empire mines are already taking steps to increase their capacity. When this takes place it is feared that many of the producers, faced with a violent disorganisation of their markets, will be forced into a long-protracted price-cutting war. This should, at all events, prevent any excessive "ramp" in copper in this country.

Prices have been:—

Cash.—Thursday, £29 5s. to £29 6s. 3d.; Friday, £28 13s. 9d. to £28 15s.; Monday, £28 8s. 9d. to £28 10s.; Tuesday, £28 5s. to £28 7s. 6d.; Wednesday, £28 5s. to £28 7s. 6d.

Three Months.—Thursday, £29 11s. 3d. to £29 12s. 6d.; Friday, £29 to £29 1s. 3d.; Monday, £28 15s. to £28 16s. 3d.; Tuesday, £28 11s. 3d. to £28 12s. 6d.; Wednesday, £28 11s. 3d. to £28 12s. 6d.

Tin.—There continues to be a fairly steady demand for this metal. The South Wales tinplate mills are showing considerable activity, and large supplies of metal are being periodically called for from that direction. The demand from other quarters, however, is very irregular. There is little difference at the moment between the "cash" and "three months'" quotations. This is due to a shortness of stocks in the London Metal Exchange warehouses, from which heavy withdrawals have recently been made.

Prices of standard tin have been:—

Cash.—Thursday, £147 to £147 2s. 6d.; Friday, £145 12s. 6d. to £145 15s.; Monday, £144 5s. to £144 7s. 6d.; Tuesday, £145 5s. to £145 7s. 6d.; Wednesday, £146 to £146 5s.

Three Months.—Thursday, £147 12s. 6d. to £147 15s.; Friday, £146 2s. 6d. to £146 5s.; Monday, £144 15s. to £145; Tuesday, £145 15s. to £145 17s. 6d.; Wednesday, £146 12s. 6d. to £146 15s.

Spelter.—The market remains depressed, largely owing to forebodings as to the future of the Cartel, which still refuses to issue any statement as to its position or intentions. In this case the market has gone on the assumption that "no news is *bad* news." A meeting of the Cartel members is now being held at Brussels. The trade demand has shown a slight expansion, noticeably from the brass industry, both in this country and in Germany.

Price fluctuations:—

Ordinary.—Thursday, £14 12s. 6d.; Friday, £14 8s. 9d.; Monday, £14 6s. 3d.; Tuesday, £14 10s.; Wednesday, £14 12s. 6d.

Lead.—The progress of the market continues to be very uncertain. The redeeming feature is the improved demand from industrial consumers, who have come into the market for supplies much earlier than they did last year. The position remains very confused, owing to the withholding of information by the producers.

Daily market prices:—

Soft Foreign (Prompt).—Thursday, £10 12s. 6d.; Friday, £10 8s. 9d.; Monday, £10 10s.; Tuesday, £10 11s. 3d.; Wednesday, £10 7s. 6d.

Leipzig Fair and Foundry Plant.

To stimulate the German inland and export trade in foundry-plant equipment, a foundry-trade section has been added to the Leipzig Trade Fair, which is being held this spring (March 5-12). The exports of foundry plant and equipment from Germany have progressively declined since 1930 from a value of 121,400,000 Reichsmarks in 1930 to 102,820,000 Rmks. in 1931 and 58,460,000 Rmks. in the first 10 months of 1932 (as against 86,060,000 Rmks. in January-October, 1931). The corresponding imports amounted to 15,890,000 Rmks. in 1930, 15,210,000 Rmks. in 1931, and 4,880,000 Rmks. in the first 10 months of 1932 (as against 13,770,000 Rmks. in January-October, 1931). A foundry-trade information bureau is also incorporated in the new section.

Fettling Goggles.

When Messrs. S. Pulzer & Son, Limited, of 45, Hatton Garden, London, E.C.1, sent in a type of fettler's goggle for our inspection, we were in a particularly critical mood. Our specification for goggles of this character is particular severe, because, unless they approach perfection, they will be out of service for the major part of the working day. Our specification enunciates that (1) the goggles must be of light weight; (2) must be dust tight; (3) well ventilated; (4) shatter proof, and (5) sweat proof. The goggles we inspected fulfilled every detail. The cups are made of thin perforated aluminium sheet, and are so devised that the glass can readily be removed for proper cleaning. The perforations are so designed that they admit air yet exclude dust. The glass is of the new armour plate variety recently marketed by Chance & Hunt. The binding of the cups is done with a material which (we are told) never reacts with sweat and becomes foul. Elastic is used for fastening to the head, and here a slight mistake has been made. The clips used for attaching are, to our mind, too fragile in character. However, it is a small detail, which the firm has promised to rectify by using heavier gauge material. We congratulate Messrs. Pulzer on the effort they have made to provide the fettler with a maximum of protection and comfort.

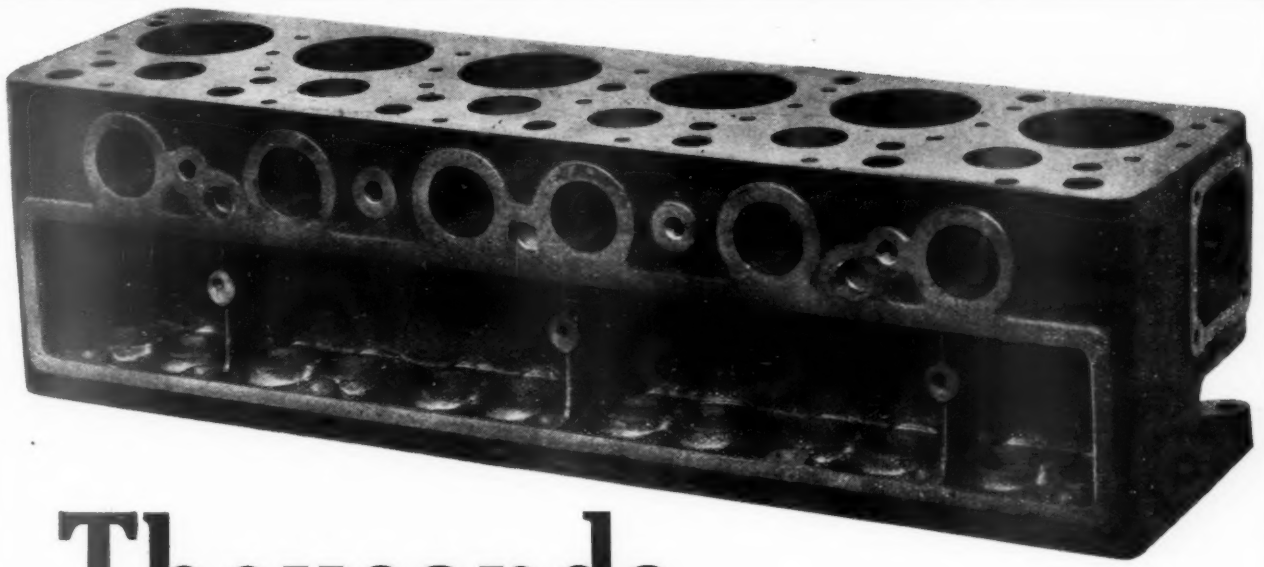
Mechanisation of Foundries.

(*Concluded from page 53.*)

carried to the moulders either by conveyors (pendulum or table type), belts or on carriage racks, as may best suit the local conditions.

This country, as so often has happened in the past, is slow to take up new methods, but having done so has soon demonstrated that for ingenuity of design and robustness of construction mechanised foundry plants can now be obtained here equal to anything produced elsewhere.

The author desires to express his thanks to the following firms who have supplied the illustrations. The photographs have been produced specially to illustrate this article:—Messrs. Bagshawe & Company, Dunstable; Foundry & Equipment, Limited, London; Foundry & Engineering Company, Limited, West Bromwich, and Herbert Morris, Limited, Loughborough.



Thousands

of these cylinder blocks on the road:

all cast with

FRODAIR

Special

PIG.

Best after test; *for 50 years*

Motor Car Manufacturers!

the best costs so little extra; is worth so much more

why hesitate! *ASK THOSE WHO KNOW—*

FRODAIR pig iron means—

Hard wearing bores, light machining, tight pistons after long mileage, absence of slap, clean exhaust, small oil and petrol consumption.

FRODAIR IRON & STEEL CO. LTD.

Fenchurch House, London, E.C.

Telegrams: "FRODAIR, LONDON."

ESTABLISHED HALF A CENTURY.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	28	5	0
Three months	28	11	3
Electrolytic	33	0	0
Tough	30	0	0
Best selected	30	10	0
Sheets	61	0	0
India	41	5	0
Wire bars	33	0	0
Do., Feb.	33	5	0
Do., March	33	10	0
Ingot bars	33	0	0
H.C. wire rods	36	0	0
Off. av. cash, December	29	2	7½
Do., 3 mths., December	29	9	7½
Do., Sttlmnt., December	29	2	4½
Do., Electro, December	34	12	2½
Do., B.S., December	32	3	7½
Do., wire bars, December	34	17	6
Solid drawn tubes			9½d.
Brazed tubes			9½d.
Wire			6½d.

BRASS.

Solid drawn tubes	8½d.
Brazed tubes	10½d.
Rods, drawn	7½d.
Rods, extd. or rlld.	4½d.
Sheets to 10 w.g.	7½d.
Wire	7½d.
Rolled metal	7d.
Yellow metal rods	4½d.
Do. 4 × 4 Squares	5½d.
Do. 4 × 3 Sheets	5½d.

TIN.

	£	s.	d.
Standard cash	146	0	0
Three months	146	12	6
English	147	0	0
Bars	148	15	0
Straits	150	12	6
Australian	148	5	0
Eastern	149	10	0
Banca	161	5	0
Off. av. cash, December	149	17	9¾
Do., 3 mths., December	151	1	0¾
Do., Sttlmt., December	149	18	6

SPELTER.

	£	s.	d.
Ordinary	14	12	6
Remelted	14	10	0
Hard	12	15	0
Electro 99.9	17	5	0
English	15	7	6
India	14	5	0
Zinc dust	21	0	0
Zinc ashes	2	15	0
Off. aver., December	15	5	6¾
Aver. spot, December	15	4	2¼

LEAD.

	£	s.	d.
Soft foreign ppt.	10	7	6
Empire	10	16	3
English	11	15	0
Off. average, December	11	6	10⅛
Average spot, December	12	2	10½

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	24	10	0
Do., V.M. ex-whse.	24	5	0
Rods	27	0	0
Boiler plates	23	0	0
Battery plates		—	

ANTIMONY.

	£	s.	d.		£	s.	d.
English	37	10	0	to	42	10	0
Chinese					27	5	0
Crude					19	10	0

QUICKSILVER.

	£	s.	d.
Quicksilver	10	5	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	£7 17 6
45/50%	£14 0 0
75%	£19 10 0
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free of Mo.	6/3 per lb.
Ferro-titanium—	
23/25% carbon-free	9½d. lb.
Ferro-phosphorus, 20/25%	£18 2 6
Ferro-tungsten—	
80/85%	1/7½ lb.
Tungsten metal powder—	
98/99%	1/10½ lb.
Ferro-chrome—	
2/4% car.	£31 10 0
4/6% car.	£24 0 0
6/8% car.	£23 2 6
8/10% car.	£21 0 0
Ferro-chrome—	
Max. 2% car.	£35 2 6
Max. 1% car.	£36 5 0
Max. 0.70% car.	£41 2 6
70%, carbon-free	11d. lb.
Nickel—99.5/100%	£250 to £255
"F" nickel shot	£225 0 0
Ferro-cobalt	7/3 lb.
Aluminium 98/99%	£100 0 0
Metallic chromium—	
96/98%	2/8 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export (nom.)	£9 15 0
Metallic manganese—	
94/96% carbon-free	1/1 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 3/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

	£	s.	d.		£	s.	d.
South Wales—							
Heavy steel					2	0	0
Bundled steel and shrngs.	1	15	0	to	1	17	6
Mixed iron and steel	1	14	0	to	1	16	6
Heavy cast iron					2	2	6
Good machinery					2	7	6
Cleveland—							
Heavy steel	1	17	6	to	2	0	0
Steel turnings					1	12	6
Cast-iron borings					1	3	6
Heavy forge					2	10	0
W.I. piling scrap					2	2	6
Cast-iron scrap	2	0	0	to	2	1	6
Midlands—							
Light cast-iron scrap					1	16	0
Heavy wrought iron					2	2	6
Steel turnings, f.o.r.					1	0	6
Scotland—							
Heavy steel					1	17	6
Ordinary cast iron	2	1	0	to	2	2	6
Engineers' turnings					1	10	0
Cast-iron borings					1	12	0
Wrought-iron piling					2	0	0
Heavy machinery	2	6	0	to	2	7	6

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	21	0	0
Brass	14	0	0
Lead (less usual draft)	9	0	0
Tea lead	7	10	0
Zinc	8	10	0
New aluminium cuttings	72	0	0
Braziery copper	19	0	0
Gunmetal	18	0	0
Hollow pewter	80	0	0
Shaped black pewter	60	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	61/-
Foundry No. 3	58/6
„ at Falkirk	54/-
Foundry No. 4	57/6
Forge No. 4	57/-
Hematite No. 1	59/6
Hematite M/Nos.	59/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	69/-
„ d/d Birm.	84/6
Malleable iron d/d Birm.	117/6
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	61/-
„ No. 3 fdry.	66/-
Northants forge	57/6
„ fdry. No. 3	62/6
„ fdry. No. 1	65/6
Derbyshire forge	61/-
„ fdry. No. 3	66/-
„ fdry. No. 1	65/-
„ basic	—
Scotland—	
Foundry No. 1	70/-
„ No. 3	67/6
Hem. M/Nos. d/d	66/-
Sheffield (d/d district)—	
Derby forge	58/6
„ fdry. No. 3	63/6
Lincs forge	—
„ fdry. No. 3	63/6
E.C. hematite	73/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby forge	62/-
„ fdry. No. 3	67/-
Staffs fdry. No. 3	67/-
Northants fdry. No. 3	65/6
Cleveland fdry. No. 3	67/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	82/-
Clyde, No. 3	82/-
Monkland, No. 3	82/-
Summerlee, No. 3	82/-
Eglinton, No. 3	82/-
Gartsherrie, No. 3	82/-
Shotts, No. 3	82/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.		£	s.	d.
Bars (cr.)	9	0	0	to	9	15	0
Nut and bolt iron	7	15	0	to	8	0	0
Hoops	10	10	0	to	12	0	0
Marked bars (Staffs) f.o.t.			12	0	0		
Gas strip	10	10	0	to	12	0	0
Bolts and nuts, ¾ in. × 4 in.			12	10	0		
Steel—							
Plates, ship, etc.	8	15	0	to	8	17	6
Boiler plts.	8	0	0	to	9	0	0
Chequer plts.			10	7	6		
Angles			8	7	6		
Tees			9	7	6		
Joists			8	15	0		
Rounds and squares, 3 in. to 5½ in.			9	7	6		
Rounds under 3 in. to ⅜ in. (Untested)			6	15	0	& up.	
Flats—8 in. wide and over			8	12	6		
„ under 8 in. and over 5 in.			8	17	6		
Rails, heavy	8	5	0	to	8	10	0
Fishplates			12	0	0		
Hoops (Staffs)	9	10	0	& up.			
Black sheets, 24g. (10-t. lots)			9	10	0		
Galv. cor. shts.	„		11	15	0		
Galv. flat shts.	„		12	5	0		
Galv. fencing wire, 8g. plain			14	0	0		
Billets, soft	4	17	6	to	5	7	6
Billets, hard	6	12	6	to	7	2	6
Sheet bars	4	15	0	to	5	2	6
Tin bars			4	15	0		

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	10½d.
Sheet to 10 w.g.	11½d.
Wire	11½d.
Rods	10½d.
Tubes	16d.
Castings	12½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	13.34
No. 2 foundry, Valley	14.50
No. 2 foundry, Birm.	11.00
Basic	15.39
Bessemer	16.89
Malleable	16.39
Grey forge	16.39
Ferro-mang. 80%, seaboard	68.00
O.-h. rails, h'y, at mill	40.00
Billets	26.00
Sheet bars	26.00
Wire rods	37.00
	Cents.
Iron bars, Phila.	1.86
Steel bars	1.60
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.60
Steel hoops	1.55
Sheets, black, No. 24	2.10
Sheets, galv., No. 24	2.85
Wire nails	1.95
Plain wire	2.20
Barbed wire, galv.	2.60
Tinplates, 100-lb. box	$4.75

COKE (at ovens).

Welsh foundry	20/- to 22/6
„ furnace	16/- to 16/6
Durham and Northumberland—	
„ foundry	21/- to 25/-
„ furnace	13/6 to 13/9
Midlands, foundry	—
„ furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box		16/-
„	28×20 „		32/-
„	20×10 „		23/-
„	18¾×14 „		16/7½
C.W.	20×14 „	13/9 to	14/-
„	28×20 „	29/3 to	29/6
„	20×10 „		19/10
„	18¾×14 „		14/-

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7	0	0
Bars-hammered, basis	£16	10	0	to	£17	0	0
Bars and nail-rods, rolled, basis	£15	17	6	to	£16	5	0
Blooms	£10	0	0	to	£12	0	0
Keg steel	£32	0	0	to	£33	0	0
Faggot steel	£18	0	0	to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0	to	£12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.		
Jan.	12 ..	29	5	0	dec.	5/-
,,	13 ..	28	13	9	,,	11/3
,,	16 ..	28	8	9	,,	5/-
,,	17 ..	28	5	0	,,	3/9
,,	18 ..	28	5	0	No change	

Electrolytic Copper.

		£	s.	d.		
Jan.	12 ..	34	5	0	dec.	2/6
,,	13 ..	34	0	0	,,	5/-
,,	16 ..	33	0	0	,,	20/-
,,	17 ..	33	0	0	No change	
,,	18 ..	33	0	0	,,	,,

Standard Tin (cash).

		£	s.	d.		
Jan.	12 ..	147	0	0	dec.	5/-
,,	13 ..	145	12	6	,,	27/6
,,	16 ..	144	5	0	,,	27/6
,,	17 ..	145	5	0	inc.	20/-
,,	18 ..	146	0	0	,,	15/-

Tin (English ingots).

		£	s.	d.		
Jan.	12 ..	148	0	0	dec.	10/-
,,	13 ..	146	15	0	,,	25/-
,,	16 ..	145	5	0	,,	30/-
,,	17 ..	146	5	0	inc.	20/-
,,	18 ..	147	0	0	,,	15/-

Spelter (ordinary).

		£	s.	d.		
Jan.	12 ..	14	12	6	dec.	3 9
,,	13 ..	14	8	9	,,	3 9
,,	16 ..	14	6	3	,,	2/6
,,	17 ..	14	10	0	inc.	3 9
,,	18 ..	14	12	6	,,	2/6

Spelter (Electro, 99.9 per cent.).

		£	s.	d.		
Jan.	12 ..	17	10	0	No change	
,,	13 ..	17	7	6	dec.	2/6
,,	16 ..	17	7	6	No change	
,,	17 ..	17	5	0	dec.	2 6
,,	18 ..	17	7	6	inc.	2 6

Zinc Sheets (English).

		£	s.	d.		
Jan.	12 ..	24	10	0	No change	
,,	13 ..	24	10	0	,,	,,
,,	16 ..	24	10	0	,,	,,
,,	17 ..	24	10	0	,,	,,
,,	18 ..	24	10	0	,,	,,

Lead (English).

		£	s.	d.		
Jan.	12 ..	12	0	0	No change	
,,	13 ..	12	0	0	,,	,,
,,	16 ..	12	0	0	,,	,,
,,	17 ..	12	0	0	,,	,,
,,	18 ..	11	15	0	dec.	5/-

Imports and Exports of Iron and Steel Castings in December and the twelve months 1932, compared with December and the twelve months 1931.

	December, 1931.	December, 1932.	Twelve months, 1931.	Twelve months, 1932.	December, 1931.	December, 1932.	Twelve months, 1931.	Twelve months, 1932.
Imports.	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Pipes and Fittings, Cast	1,105	51	13,744	2,773	15,739	1,614	183,262	47,960
Castings, in the Rough, Iron	88	1	1,366	559	2,017	45	28,277	10,159
,, ,, ,, Steel	609	42	6,481	1,570	11,206	569	130,805	30,153
Hollow-ware, Cast, not Enamelled	2	3	71	49	110	217	4,863	3,181
,, ,, Enamelled	—	12	50	249	63	559	2,851	7,796
Exports.								
BUILDERS' CASTINGS—								
To Argentine Republic	33	10	833	308	1,353	487	39,499	11,430
,, Irish Free State	482	292	4,707	3,526	22,663	12,006	217,234	155,492
,, British South Africa	208	98	2,422	1,507	5,963	3,589	85,114	53,583
,, ,, India	76	84	1,285	891	3,244	2,836	45,662	33,827
,, New Zealand	28	40	358	347	2,132	2,604	22,174	18,861
Total (including other countries)	1,222	859	13,962	10,536	53,137	36,855	618,341	442,894
PIPES AND FITTINGS—CAST—								
To Argentine Republic	370	17	5,305	1,521	2,727	477	50,625	16,732
,, Irish Free State	843	302	13,251	6,111	11,704	4,616	157,814	84,331
,, British South Africa	1,332	442	8,224	4,385	12,077	4,621	92,314	50,622
,, ,, India	79	87	1,662	1,101	1,697	1,970	27,076	18,307
,, Straits Settlements and Malay States	164	45	2,721	2,340	1,756	618	29,643	23,389
Total (including other countries)	7,093	5,186	72,776	65,635	64,026	55,144	804,930	671,439
HOLLOW-WARE—								
Cast, not Enamelled, and Cast, Tinned	239	252	2,262	2,555	8,370	8,715	79,655	88,769
,, Enamelled	77	50	587	790	6,205	3,833	55,379	65,326
CASTINGS, in the rough—								
Iron	111	108	2,341	1,114	3,398	3,615	58,842	38,379
Steel	29	53	1,093	724	1,089	3,285	39,388	32,095

WILLIAM JACKS & COMPANY,
WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

CLARENCE CHAMBERS, 39, CORPORATION STREET, BIRMINGHAM.
13, RUMFORD STREET, LIVERPOOL.

PIG

IRON

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,
CENTRAL CHAMBERS, 93, HOPE ST., GLASGOW, C.2.
ZETLAND ROAD, MIDDLESBROUGH.

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(A remittance should accompany instructions.)

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ADVERTISER desires position as Foundry Manager or Foreman; practical, technical and commercial training all branches foundry work, thorough knowledge of metallurgy and mixing of metals; can take entire charge.—Box 318, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

BRASS FOUNDRY FOREMAN desires position; experienced in Admiralty contracts, gunmetal, phos. bronze and manganese castings; 12 years foreman in last situation.—Box 258, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY SUPERINTENDENT of the B.T.-H. Company, Limited, Rugby, has resigned his position, and would be glad to hear from anyone who can make use of his services. Highest references. Iron and non-ferrous. Age 42. Life experience.—Haines, 46, Claremont Road, Rugby.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of The Foundry Trade Journal.

Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, from whom full particulars can be obtained of this service.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

PRACTICAL Foundry Manager desires engagement. Wide and varied experience, machine tools, light castings, turbine and engine work. Rotary furnace experience. (204)

POSITION required as Works or Foundry Manager, or as Representative. Wide experience in ferrous and non-ferrous foundries with first-class firms. Highest credentials. (205)

YOUNG Foundry Manager requires position or as Assistant. Good general and technical education, sound experience as Moulder and in supervisory capacity. (206)

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MAGNIFICENT

11 ACRES WORKS SITE.

SHEFFIELD.

145,000 Sq. Ft. of Shops.

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with L.M. & S. and L. & N.E. Rlys.

WELL-BUILT & COMMODIOUS OFFICES

Will Sell whole or in lots to suit customers or Let on favourable terms. Unique opportunity for Manufacturers.

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ALBION WORKS, SHEFFIELD.

PATENTS.

THE Owner of British Patent No. 304302, relating to "Improvements in Ingot Moulds," is desirous of entering into negotiations for the grant of licences or otherwise, under suitable terms, for the purpose of exploiting the invention and ensuring its full development and practical working in this country.—For particulars, address, Arthur Sadler, 65, Temple Row, Birmingham.

THE Proprietors of the Patents Nos. 228520, 228528 and 300486, for "Improvements in or relating to Means for Casting Hollow Bodies," "Improvements in or relating to Apparatus for Inserting the Socket Cores for Tubes and the like," and "Improvements in or relating to the Casting of Pipes and other Hollow Metal Bodies by the Centrifugal Casting Process" respectively, are desirous of entering into arrangements by way of licence and otherwise on reasonable terms for the purpose of exploiting the same and ensuring their full development and practical working in this country.—All communications should be addressed in the first instance to Haseltine, Lake & Company, 28, Southampton Buildings, Chancery Lane, London, W.C.2.

PUBLICATION.

RYLAND'S DIRECTORY of the Coal, Iron, Steel, Tinplate, Metal, Engineering, Hardware and Allied Trades. 1932 edition. Price 42s., bound in cloth.—Industrial Newspapers, Ltd., 49, Wellington Street, Strand, London, W.C.2.

MACHINERY.

FOR Sale, Denison Foundry Testing Machine for Tensile and Transverse Tests. In perfect condition. £35 net.—T. C. Howden & Company, 7, Fleet Street, Birmingham.

ELEC. Travelling Wharf Crane. All motions. Cheap.—A. Morgan, 50, Wilkin Street, N.W.5. Gul. 1147

SAND BLASTING PLANTS FOR SALE

Tilghman Sand Blast Room, 6 ft. x 6 ft. x 8 ft. high.

Tilghman Rotary Barrel, 36 in. x 30 in.

Tilghman Rotary Double Barrel Plant, barrels 24 in. x 20 in.

Tilghman 4-ft. 6-in. x 3-ft. Cabinet Plant.

Tilghman 30-in. dia. Cabinet Plant.

Jackman Rotary Barrel, 30 in. x 24 in.

Each Plant complete with Sand Apparatus, Air Compressor and Exhaust Fan.

Large stock of FOUNDRY PLANT at LOW PRICES.

S. C. BILSBY, A.M.I.C.E., A.M.I.E.E.

215, BARCLAY ROAD, WARLEY,

Nr. Birmingham.

'Phone : Bearwood 1103.

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